Freeway® User Guide

DC 900-1333P

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Freeway User Guide
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Preface

Purpose of Document

This document describes how to install and operate software on Protogate's Freeway server.

Note

The information in this document refers to the Freeway models from Protogate and Simpact that use the VxWorks operating system. As of this document revision (Feb 2002), these Freeway models have been replaced with newer hardware models. The specifications of the newer hardware will be reflected in a later edition of this document. Go to Protogate's web page (www.protogate.com) for more information.

Intended Audience

This document should be read by users who install and operate the Freeway series of servers. The Freeway server has many utilities that allow you to configure and control the run-time operation of the server.

Required Equipment

Items Supplied by Protogate

- Freeway unit

- Power cord (Freeway 1300 and 8800 have two power cords)
- Set of keys (for hinged front panel on Freeway 1100/1150/1200/1300)
- Console cable (each end of the cable has both a 9-pin and a 25-pin connector) (Freeway 1100/1150/1200/1300)
- Cable with a 9-pin and a 25-pin connector on each end (Freeway 2000/4000/8800 with an MVME 2600 CPU board)
- Appropriate serial cables to connect the ICPs to the data communications equipment (Freeway 1100/1150/1200/1300)
- Boot parameter initialization disk (Freeway 1100/1150/1200/1300)
- SCSI II-style high-density termination connector (Freeway 2000/4000, unless you have purchased a Freeway 2000/4000 with a CPU 8)
- Anti-static strap
- Two-headed loopback cable(s), one per Freeway ICP (Freeway 1100/1150/1200/1300)
- Three-headed loopback cable(s), one per Freeway ICP (all Freeways)
- Software distribution media
- Various documentation

Items Supplied by You

- Standard Ethernet or Fast Ethernet local-area network
- Computer running TCP/IP and FTP or RSH to be used as a boot server
- VT100-compatible terminal or terminal emulator to be used as the Freeway local console, plus a standard null modem EIA-232, 25-pin cable for connecting it to Freeway. (The Freeway 1100, 1150, 1200, or 1300 server can be booted using a local console or by using the boot parameters initialization disk.)

- Cables for connecting Freeway to the LAN and WAN
- Synchronous modem for loopback testing

Organization of Document

Chapter 1 gives an overview of the Freeway server.

Chapter 2 describes the Freeway software installation procedures.

Chapter 3 describes how to customize the system configuration.

Chapter 4 describes the Freeway menus used in basic operation.

Appendix A gives a quick summary of the installation procedures that were described in detail in Chapter 2 and instructions for building a client application.

Appendix B gives an overview of the files that make up the Freeway software.

The Glossary lists Freeway terminology and acronyms.

Protogate References

The following general product documentation list is to familiarize you with the available Protogate Freeway and embedded ICP products. The applicable product-specific reference documents are mentioned throughout each document (also refer to the "readme" file shipped with each product). Most documents are available on-line at Protogate's web site, www.protogate.com.

General Product Overviews

- *Freeway 1100 Technical Overview* 25-000-0419
- *Freeway 2000/4000/8800 Technical Overview* 25-000-0374
- *ICP2432 Technical Overview* 25-000-0420
- *ICP6000X Technical Overview* 25-000-0522

Hardware Support

- *Freeway 500 Hardware Installation Guide* DC-900-2000
- *Freeway 1100/1150 Hardware Installation Guide* DC-900-1370
- *Freeway 1200/1300 Hardware Installation Guide* DC-900-1537
- *Freeway 2000/4000 Hardware Installation Guide* DC-900-1331
- *Freeway 3100 Hardware Installation Guide* DC-900-2002
- *Freeway 3200 Hardware Installation Guide* DC-900-2003
- *Freeway 3400 Hardware Installation Guide* DC-900-2004
- *Freeway 3600 Hardware Installation Guide* DC-900-2005
- *Freeway 8800 Hardware Installation Guide* DC-900-1553
- *Freeway ICP6000R/ICP6000X Hardware Description* DC-900-1020
- *ICP6000(X)/ICP9000(X) Hardware Description and Theory of Operation* DC-900-0408
- *ICP2424 Hardware Description and Theory of Operation* DC-900-1328
- *ICP2432 Hardware Description and Theory of Operation* DC-900-1501
- *ICP2432 Electrical Interfaces (Addendum to DC-900-1501)* DC-900-1566
- *ICP2432 Hardware Installation Guide* DC-900-1502

Freeway Software Installation and Configuration Support

- *Freeway Message Switch User Guide* DC-900-1588
- *Freeway Release Addendum: Client Platforms* DC-900-1555
- *Freeway User Guide* DC-900-1333
- *Freeway Loopback Test Procedures* DC-900-1533

Embedded ICP Software Installation and Programming Support

- *ICP2432 User Guide for Digital UNIX* DC-900-1513
- *ICP2432 User Guide for OpenVMS Alpha* DC-900-1511
- *ICP2432 User Guide for OpenVMS Alpha (DLITE Interface)* DC-900-1516
- *ICP2432 User Guide for Solaris STREAMS* DC-900-1512
- *ICP2432 User Guide for Windows NT* DC-900-1510
- *ICP2432 User Guide for Windows NT (DLITE Interface)* DC-900-1514

Application Program Interface (API) Programming Support

- *Freeway Data Link Interface Reference Guide* DC-900-1385
- *Freeway Transport Subsystem Interface Reference Guide* DC-900-1386
- *QIO/SQIO API Reference Guide* DC-900-1355

Socket Interface Programming Support

- *Freeway Client-Server Interface Control Document* DC-900-1303

Toolkit Programming Support

- *Freeway Server-Resident Application and Server Toolkit Programmer Guide* DC-900-1325
- *OS/Impact Programmer Guide* DC-900-1030
- *Protocol Software Toolkit Programmer Guide* DC-900-1338

Protocol Support

- *ADCCP NRM Programmer Guide* DC-900-1317
- *Asynchronous Wire Service (AWS) Programmer Guide* DC-900-1324
- *AUTODIN Programmer Guide* DC-908-1558
- *Bit-Stream Protocol Programmer Guide* DC-900-1574
- *BSC Programmer Guide* DC-900-1340
- *BSCDEMO User Guide* DC-900-1349
- *BSCTRAN Programmer Guide* DC-900-1406
- *DDCMP Programmer Guide* DC-900-1343
- *FMP Programmer Guide* DC-900-1339
- *Military/Government Protocols Programmer Guide* DC-900-1602
- *N/SP-STD-1200B Programmer Guide* DC-908-1359
- *SIO STD-1300 Programmer Guide* DC-908-1559
- *X.25 Call Service API Guide* DC-900-1392
- *X.25/HDLC Configuration Guide* DC-900-1345
- *X.25 Low-Level Interface* DC-900-1307

Document Conventions

The term “Freeway” refers to any of the Freeway models (for example, 1100, 1150, 1200, 1300, 2000, 4000, or 8800).

A Freeway with an MVME 162 CPU board is a 68K-based Freeway 2000/4000/8800 with a CPU 7, 8, 9, or 10 based on the Motorola MVME 162 single-board computer. The handle of the CPU board is labelled “MVME 162.”

A Freeway with an MVME 2600 CPU board is a Power PC-based Freeway 2000/4000/8800 with a CPU 11, 12, or 14 based on the Motorola MVME 2600 single-board computer. The handle of the CPU board is labelled “MVME 2600.”

Program code samples are written in the “C” programming language.

Earlier Freeway terminology used the term “synchronous” for blocking I/O and “asynchronous” for non-blocking I/O. Some parameter names reflect the previous terminology.

Revision History

The revision history of the *Freeway User Guide*, Protogate document DC 900-1333P, is recorded below:

Revision	Release Date	Description
DC 900-1333A	May 1994	Original release
DC 900-1333B	September 1994	Added Freeway 1000 information Updated installation procedures Updated operation procedures
DC 900-1333C	November 1994	Updated installation procedures
DC 900-1333D	February 1995	Updated installation procedures
DC 900-1333E	March 1995	Added more detailed Freeway 1000 information
DC 900-1333F	May 1995	Enhanced boot parameters information, updated menus, and added loopback information for AWS and ADCCP NRM

Revision	Release Date	Description
DC 900-1333G	March 1996	Updated for version 2.4 release Removed bootp information Clarified server toolkit information Replaced X.25 loopback test with CS API test Added information on: • DDCMP • ICP6030 • Marketfeed 2000 • TACMIL • Windows NT
DC 900-1333H	May 1997	Updated for version 2.7 server release Added Freeway 8800 information
DC 900-1333I	August 1997	Updated for version 2.7.1 server release; user must now build binary and library files Deleted Freeway 1000 information Added Freeway 1100 information
DC 900-1333J	June 1998	Updated for version 2.8 server release Moved loopback tests to separate document
DC 900-1333K	December 1998	Updated for server toolkit release
DC 900-1333L	February 1999	Updated for ICP_IP virtual devices Added Freeway 1150 information Moved port numbering and cabling and LED appendices to hardware documents
DC 900-1333M	June 1999	Updated for version 2.9 server release Updated menu options Added send and receive buffer size options to the bootcfg.ip file Added Freeway 1200 and 1300 information
DC 900-1333N	July 1999	Added SNMP information (Section 1.2.4 on page 27, Figure 4–15 on page 137, and Figure 4–17 on page 139)
DC 900-1333O	December 1999	Added new boot flag, 0x2000 Added snd_q_size, connect_period, linger_on, and linger_off configuration parameters to Section 3.2.1 Added sock_stream_listen and sock_stream_ connect to socket type parameter
DC 900-1333P	February 2002	Update document with Protogate contact information.

Customer Support

If you are having trouble with any Protogate product, call us at (858) 451-0865 Monday through Friday between 8 a.m. and 5 p.m. Pacific time.

You can also fax your questions to us at (877) 473-0190 any time. Please include a cover sheet addressed to “Customer Service.”

We are always interested in suggestions for improving our products. You can use the report form in the back of this manual to send us your recommendations.

Chapter

1

Freeway Introduction

This manual describes how to install and operate software on your Freeway server. Before installing the server software, you should familiarize yourself with basic Freeway concepts as described in this introductory chapter. Then you can proceed to Chapter 2 which contains the software installation procedures. Refer to the Glossary for Freeway terminology and acronyms.

1.1 Freeway Overview

Protogate provides a variety of wide-area network (WAN) connectivity solutions for real-time financial, defense, telecommunications, and process-control applications. Protogate's Freeway server offers flexibility and ease of programming using a variety of LAN-based server hardware platforms.

Protogate's Freeway communications servers enable client applications on a local-area network (LAN) to access specialized WANs through the DLI. The Freeway server can be any of several models (for example, Freeway 1100/1150, Freeway 1200/1300, Freeway 2000/4000, or Freeway 8000/8800). The Freeway server is user programmable and communicates in real time. It provides multiple data links and a variety of network services to LAN-based clients. Figure 1–1 shows the Freeway configuration.

To maintain high data throughput, Freeway uses a multi-processor architecture to support the LAN and WAN services. The LAN interface is managed by a single-board computer, called the server processor. It uses the commercially available VxWorks operating system to provide a full-featured base for the LAN interface and layered services needed by Freeway.

Freeway can be configured with multiple WAN interface processor boards, each of which is a Protogate ICP. Each ICP runs the communication protocol software using Protogate's real-time operating system.

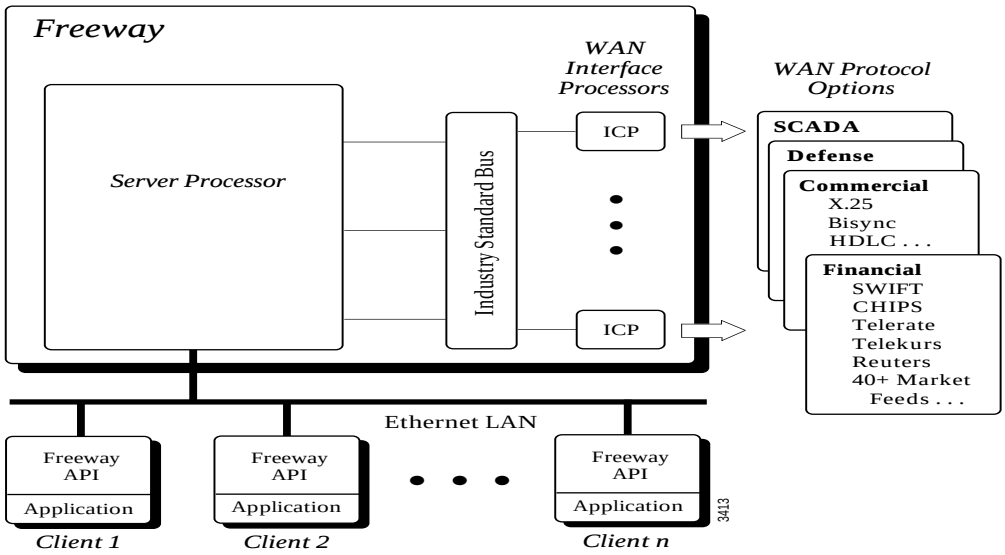

Figure 1–1: Freeway Configuration

Summary of product features:

- Provision of WAN connectivity either through a LAN-based Freeway server or directly using an embedded ICP
- Elimination of difficult LAN and WAN programming and systems integration by providing a powerful and consistent data link interface
- Variety of off-the-shelf communication protocols available from Protogate which are independent of the client operating system and hardware platform
- Support for multiple WAN communication protocols simultaneously
- Support for multiple ICPs (two, four, eight, or sixteen communication lines per ICP)
- Wide selection of electrical interfaces including EIA-232, EIA-449, EIA-530, and V.35
- Creation of customized server-resident and ICP-resident software, using Protogate's software development toolkits
- Freeway server standard support for Ethernet and Fast Ethernet LANs running the transmission control protocol/internet protocol (TCP/IP)
- Freeway server standard support for FDDI LANs running the transmission control protocol/ internet protocol (TCP/IP)
- Freeway server management and performance monitoring with the simple network management protocol (SNMP), as well as interactive menus available through a local console, telnet, or rlogin

1.2 Freeway Concepts

The following concepts support the Freeway features described in Section 1.1.

1.2.1 Freeway Services

Freeway can be configured to offer a number of services to clients residing on the LAN. These services are shared among applications designed to operate in the client/server model of today's distributed computing environment.

Freeway offers Protogate's real-time data communication protocols. These services allow clients to connect to primary and consolidated financial feeds, military satellite communications, process control monitoring, telecommunications network monitoring, and similar applications.

1.2.2 User Customization

If one of the standard services offered by Freeway does not meet the requirements of your application, you can develop and integrate customized services into Freeway using Protogate's software development kits. The *Protocol Software Toolkit Programmer Guide* explains how to develop real-time protocols that run on an ICP residing within Freeway. The *Freeway Server-Resident Application and Server Toolkit Programmer Guide* explains how to develop server-resident applications.

1.2.3 Server Management

Server Management is supported through an interactive menu interface that can be accessed either through a local console serial port, or via remote login using telnet or rlogin facilities. Functions such as physical and service configuration, monitoring of server operation, system shutdown, and system startup are described in Chapter 4.

1.2.4 SNMP Support

Freeway software provides an SNMP v1/v2c-compliant SNMP agent that supports read-only SNMP access to Freeway-supported MIBs. Freeway provides SNMP support for the MIBs listed below, regardless of which ICP-resident protocol service is used.

- Protogate enterprise MIB for Freeway
- RFC-1213 (MIB-II) support for LAN interfaces

Selected ICP-resident protocol services provide additional SNMP support for read-only access to the MIBs listed below.

- RFC-1213 (MIB-II) interfaces group for WAN ports on the ICP
- RFC-1659 (rs232-like-devices) for WAN ports on the ICP

The Protogate enterprise MIB for Freeway is published with the Freeway software as the freeway/include/freeway.mib file. The RFC-1213 and RFC-1659 MIB definitions may be obtained via the Internet without charge.

Chapter

2 Software Installation

This chapter describes how to install the Freeway server/client, protocol, and toolkit software. You must have installed the Freeway hardware as described in the appropriate Freeway hardware installation guide.

Note

After you have followed the detailed software installation procedures outlined in this chapter, you can refer to the "Installation at a Glance" summary in Appendix A as a quick reference for future installations.

After you finish these procedures, familiarize yourself with Freeway operations as described in Chapter 4. You might also want to review Appendix B which gives an overview of the files that make up the Freeway software.

Note

If you are installing more than one protocol, it is best to perform the software installation and loopback verification testing for one protocol before attempting to customize your Freeway system for multiple protocols (described in Chapter 3).

Table 2–1 summarizes the software installation steps.

Table 2–1: Summary of Software Installation Steps

Steps	Reference Section(s)
1. Select a UNIX, VMS, or Windows NT computer on the same LAN as Freeway that supports TCP/IP and the file transfer protocol (FTP) or, for UNIX or Windows NT, remote shell (RSH). You will use this computer for Freeway software installation and also configure it as the Freeway boot server.	
2. Configure the computer to act as a boot server.	Section 2.1 on page 32
3. Load the Freeway software from the distribution media onto the boot server you selected in Step 1[1].	Section 2.2 on page 37 for UNIX Section 2.3 on page 57 for VMS Section 2.4 on page 75 for Windows NT
4. Modify the boot and load files.	Section 2.2.3 on page 45 for UNIX Section 2.3.3 on page 66 for VMS Section 2.4.3 on page 82 for Windows NT
5. Build the DLI and TSI files.	Section 2.2.4 on page 48 for UNIX Section 2.3.4 on page 69 for VMS Section 2.4.4 on page 84 for Windows NT
6. For X.25 only, build the CS API library file.	Section 2.2.5 on page 49 for UNIX Section 2.3.5 on page 70 for VMS Section 2.4.5 on page 86 for Windows NT
7. Compile the example server-resident application (UNIX and Windows NT).	Section 2.2.6 on page 50 for UNIX Section 2.4.6 on page 87 for Windows NT
8. Compile the Server Toolkit (UNIX and Windows NT).	Section 2.2.7 on page 52 for UNIX Section 2.4.7 on page 89 for Windows NT
9. Build the QIO/SQIO API library file (VMS only).	Section 2.3.6 on page 71 for VMS
10. Build the loopback test(s) using the appropriate make file.	Section 2.2.8 on page 53 for UNIX Section 2.3.7 on page 71 for VMS Section 2.4.8 on page 90 for Windows NT
11. Modify the Freeway System Boot Parameters.	Section 2.5 on page 93
12. Boot Freeway.	Section 2.6 on page 94
13. Run the loopback test.	*Freeway Loopback Test Procedures* manual

[1] Installing new software overwrites the previous software.

The software installation procedures described in this chapter refer to file names that include a "*ppp*" identifier to indicate a specific protocol. Table 2–2 shows the "*ppp*" identifiers for various protocols. For example, *ppp*alp translates to awsalp for AWS, fmpalp for FMP, or spsalp for protocol toolkit.

Table 2–2: Protocol Identifiers

Protocol or Toolkit	Protocol Identifier (***ppp***)
AUTODIN	autodin[1]
AWS	aws
BSC3270	bsc3270[2]
BSC2780/3780	bsc3780[a]
DDCMP	ddcmp
FMP	fmp
ADCCP NRM	nrm
Protocol Toolkit	sps
Server-resident Application	sra[3]
STD1200B	s12
Military/Government	mil[4]
X.25/HDLC	x25[5]

[1] Except for the readme and release notes, where *ppp* is adn.
[2] Except for the load configuration files where *ppp* is bsc for both BSC3270 and BSC2780/3780.
[3] Except for the executable object for the protocol software where *ppp* is sps (sps_fw_2424.mem, sps_fw_2432.mem, and sps_fw_6000.mem).
[4] Except for the load configuration files where *ppp* is mil*xxxyyy* (*xxxyyy* identifies the particular Military/Government product designation, distinguished by the unique subset of the full set of military protocols that it contains).
[5] Except for the DLI and TSI configuration files which are apidcfg and apitcfg and the test directory where *ppp* is x25mgr.

On UNIX systems, all default directories are installed under /usr/local/freeway. On VMS systems, they are installed under SYS$SYSDEVICE:[FREEWAY]. On Windows NT systems, they are installed under C:\freeway.

2.1 Configure the Boot Server

Before you can boot Freeway, the boot server and Freeway must be configured to communicate with each other. Multiple Freeway servers can be configured to boot from the same boot server. The following steps are required:

1. Create a file transfer protocol (FTP) or remote shell (RSH) user account on the boot server (Section 2.1.2); as shipped, the boot parameters are set to boot the system using FTP.

2. Define the system names and Internet addresses for Freeway, the boot server, and the gateway processor (if applicable) on the boot server (Section 2.1.3).

Your system administrator might have already completed these steps during the hardware installation procedures described in the hardware installation guide for your Freeway. If so, skip this section and proceed with Section 2.2 on page 37 for UNIX, Section 2.3 on page 57 for VMS, or Section 2.4 on page 75 for Windows NT.

During the boot process Freeway is considered a client while it downloads files over the Ethernet from the Freeway boot directory located on the boot server. After the boot process completes, Freeway starts its normal role as a communications server for its clients. Section 4.3.1 on page 122 describes the boot process.

Freeway supports the FTP or RSH configuration in the boot process (Section 2.1.1 through Section 2.1.3).

2.1.1 Configure FTP or RSH

The boot server must support the file transfer protocol (FTP) or remote shell (RSH). RSH is available on UNIX and Windows NT systems, but not on VMS systems.

Freeway uses FTP or RSH to request each of its download files from the boot server. To respond to the download requests, the boot server must also have the FTP or RSH daemon process running.

On UNIX systems, the /etc/inetd.conf command file usually starts the FTP or RSH daemon process. Refer to your UNIX user manuals for details.

On VMS systems, if you don't already have a TCP/IP package that supports FTP, you must install one. Refer to the user manuals for the software you are using to find out how to configure the FTP daemon process.

On Windows NT systems, refer to your Windows NT administration manuals for details on how to start the FTP or RSH server.

2.1.2 Create the FTP or RSH User Account on the Boot Server

Using FTP or RSH for downloading requires Freeway to log in to the boot server. By default, Freeway logs in with the FTP user name of freeway and an FTP password of password. Create an FTP user account on the boot server to match these values. This account, freeway, must have read/write/execute access to all installed files in the directories and subdirectories below freeway. For instructions on how to create user accounts, refer to your system administrator's guide or consult your system administrator.

If you prefer to use RSH on your UNIX or Windows NT system, you must still set up a user account, but the password is not used for accessing the boot server through its remote shell daemon.

In UNIX systems, the files to which Freeway requires access are in the default /usr/local/freeway directory which is created during the installation procedure described in Section 2.2.2.

In VMS systems, the files to which Freeway requires access are in the default SYS$SYSDEVICE:[FREEWAY] directory which is created during the installation procedure described in Section 2.3.2.

In Windows NT systems, the files to which Freeway requires access are in the default C:\freeway directory which is created during the installation procedure described in Section 2.4.2

You can change the default FTP user name and FTP password that Freeway uses by changing the corresponding boot parameters on the Freeway system as described in Section 4.5.1 on page 148. If you do, remember that you must also change the user name and password of the FTP account on the boot server.

2.1.3 Define Freeway to the Boot Server

In this section you will define Freeway's Internet protocol address (henceforth called the Internet address) and system name to the boot server. The boot server needs this information so it can communicate with Freeway. You will need this information to configure the Freeway boot parameters.

If your boot server is running VMS, configuring Internet addresses depends on the TCP/IP package installed on your computer. Consult your TCP/IP documentation for instructions on how to define system names and Internet addresses for your VMS computer.

If you have a UNIX or Windows NT boot server, use the following procedure:

Step 1: For UNIX systems, the Internet addresses and system names of computers on the network are maintained in the /etc/hosts file.

For Windows NT systems, the Internet addresses and system names of computers on the network are maintained in the hosts or lmhosts file.

If your network is managed by a domain name server, the hosts file should not be edited locally, as it is maintained and distributed by the domain name server. If you are not using a domain name server, this file can be edited on the boot server. In the hosts file, find the Internet address and system name of the computer you have selected as your boot server. Figure 2–1 shows a sample UNIX /etc/hosts file in which the boot server has an Internet address of 192.168.45.1 and a system name of bootmaster.

```
# This is the master Internet address file for XYZ Corporation.
# If you need an address, check here first to make sure it is not
# being used. If it is not, add the address, the system name for the
# device, and the owner. You can then export this file to your device
# if it is appropriate.
#
#
# ************************************************************
#               TCP HOST TABLE
# ************************************************************
#
# 127.0.0.1      loopback --- do not remove.
#
127.0.0.1        localhost
#
#
#
192.168.45.1        bootmaster        # Boot server for Freeway systems
192.168.45.2        accnt             # accounting
192.168.45.3        sales             # sales
192.168.45.4        mktg              # marketing
192.168.45.5        prod              # production
192.168.45.6        freeway1          # Freeway system 1
192.168.45.7        freeway2          # Freeway system 2
```

Figure 2–1: Sample UNIX /etc/hosts File

Step 2: Select a system name and Internet address for the Freeway server and enter them on a line in the hosts files of the Freeway boot server and any LAN network device that will be communicating with Freeway. If you have more than one Freeway server, enter one line for each server. In the sample hosts file in Figure 2–1, two Freeway servers have been defined. The first has an Internet address of 192.168.45.6 and a system name of freeway1. The second has an Internet address of 192.168.45.7 and a system name of freeway2.

If your Freeway server has multiple LAN interface boards (for example, dual Ethernet), enter a line for each board in the hosts file of any LAN network device that will be communicating with that board. Although this step is required only if you wish to assign a logical name to each LAN interface, it is recommended to ensure that the Internet address of each board is reserved for its exclusive use. *No two LAN interface boards within a Freeway may be configured to operate on the same sub-network.*

Step 3: Write down the Internet address and system name for both Freeway and the boot server.

2.2 Install the Freeway Software onto a UNIX Computer

This section describes how to install the Freeway software from the distribution media onto a UNIX computer. Later in these procedures you will use this computer as a boot server to boot Freeway.

Note

After you have followed the detailed software installation procedures outlined in this chapter, you can refer to the "Installation at a Glance" summary in Appendix A as a quick reference for future installations.

2.2.1 Contents of the UNIX Distribution Media

Freeway software for UNIX computers is distributed on the following types of media in tar or cpio format. The label on the media identifies the format used.

- Quarter-inch cartridge
- Quarter-inch datastream
- TK50 cartridge
- 4mm tape
- 8mm tape
- CD-ROM

2.2.1.1 Server/Client Software

The server/client distribution media is labeled Freeway Server Software.

The following files are in the freeway directory:

- readme.ser provides general information about the server software
- relnotes.ser provides specific information about the current release of the server software
- env486, env68k, envcom, and envppc are environment definition files for the example server-resident application (SRA)
- MakeSRA.I486, MakeSRA.68K, and MakeSRA.ppc are make files for the example SRA

The following general files are in the freeway/boot directory:

- bootcfg.ip is an example boot configuration file for ICP_IP virtual devices
- bootcfg.isa is the boot configuration file for a Freeway 1100 with ICP2424s (ISA-bus boards)
- bootcfg.pci is the boot configuration file for a Freeway 1100 with ICP2432s (PCI boards) and Freeway 1150/1200/1300
- bootcfg.vme is the boot configuration file for Freeway 2000/4000/8800
- fw486 is the system boot file for Freeway 1100/1150/1200/1300
- fw162 is the standard system boot file for a Freeway 2000/4000/8800 with an MVME 162 CPU 9 or CPU 10
- fw162l is the limited memory system boot file for a Freeway 2000/4000/8800 with an MVME 162 CPU 7 or CPU 8

- fw2604 is the system boot file for a Freeway 2000/4000/8800 with an MVME 2600 CPU
- fw486.sym is the symbol table for the Freeway 1100/1150/1200/1300 boot image
- fw162.sym is the standard symbol table for the boot image of a Freeway 2000/4000/8800 with an MVME 162 CPU 9 or CPU 10
- fw162l.sym is the limited memory symbol table for the boot image of a Freeway 2000/4000/8800 with an MVME 162 CPU 7 or CPU 8
- fw2604.sym is the symbol table for the boot image of a Freeway 2000/4000/8800 with an MVME 2600 CPU
- muxcfg[1] is the server TSI configuration file
- xio_2424.mem, xio_2432.mem, or xio_6000.mem[2] are the executable objects for the system-services module

The following files specific to the server-resident application (SRA) are also in the freeway/boot directory:

- buffer.size is the buffer size file for the protocol toolkit used with the example SRA
- ftstdcfg, ftsttcfg, sradcfg, and sratcfg are the data link interface (DLI) and transport subsystem interface (TSI) configuration files for the example SRA
- fw486d is the debug version of the system boot file for Freeway 1100/1150/1200/1300

1. The example server-resident application uses muxcfg.sra. The Military/Government protocol uses milmuxcfg.

2. Freeway server release G (and later) installs the XIO image files in the freeway/boot directory. Prior to June 1, 1998, the XIO image files were distributed in the freeway/icpcode/icp*xxxx*/osimpact directory. As a result, the load files provided with protocols with a release date prior to June 1, 1998 contain a fully qualified path for the protocol and XIO image files. Such files should be modified to remove the path to the XIO image. This allows Freeway to boot the local copy of the XIO image provided in the freeway/boot directory with the current Freeway server release.

- fw162d is the debug version of the standard system boot file for a Freeway 2000/4000/8800 with an MVME 162 CPU 9 or CPU 10
- fw2604d is the debug version of the system boot file for a Freeway 2000/4000/8800 with an MVME 2600 CPU
- fw486d.sym is the symbol table for the Freeway 1100/1150/1200/1300 debug server image
- fw162d.sym is the standard symbol table for the debug server image of a Freeway 2000/4000/8800 with an MVME 162 CPU 9 or CPU 10
- fw2604d.sym is the symbol table for the debug server image of a Freeway 2000/4000/8800 with an MVME 2600 CPU
- sps_fw_2424.mem, sps_fw_2432.mem, or sps_fw_6000.mem are the executable objects for the protocol toolkit used with the example SRA
- sra486.o, sra68K.o, and srappc.o are the object modules for the example SRA
- sraload is the load file for the example SRA
- muxcfg.sra is the server TSI configuration file used with the example SRA

The example SRA source code is in the freeway/client/test/sra directory.

The data link interface (DLI) and transport subsystem interface (TSI) software is in the freeway/lib directory.

2.2.1.2 Server Toolkit Software

The Server Toolkit distribution media is labeled Freeway Server Toolkit Software.

The following files delivered with the Server Toolkit are in the freeway directory:

- readme.stk provides general information about the Server Toolkit software
- relnotes.stk provides specific information about the current release of the Server Toolkit software
- MakeSTK.I486, MakeSTK.68K, and MakeSTK.ppc are make files for the Server Toolkit software

The following files are in the freeway/boot directory:

- vx162, vx486, and vx2604 are VxWorks operating system images
- vx162.sym, vx486.sym, and vx2604.sym are symbol tables for the VxWorks operating system images

A binary object file (usrSimpact.o) providing an entry point for the Freeway software is stored in the freeway/server/bin/mv162, freeway/server/bin/mv2604, and freeway/server/bin/pc486 directories.

The Freeway server software library archive called libserv.a and the server DLI/TSI object library called libvxwfw.o are stored in the freeway/server/lib/mv162, freeway/server/lib/mv2604, and freeway/server/lib/pc486 directories.

Source code that may be modified to tailor the VxWorks operating system of the Freeway server is provided in the freeway/server/vw/config directory.

Make files for rebuilding the server DLI/TSI object library are provided in the freeway/lib directory.

2.2.1.3 Protocol or Protocol Toolkit Software

The protocol or protocol toolkit distribution media is labeled Freeway *[Name]* Software.

Note

The *ppp* variable mentioned below specifies the particular protocol or toolkit you are using (refer to Table 2–2 on page 31).

The following files are in the freeway directory:

- readme.*ppp* provides general information about the protocol or protocol toolkit software
- relnotes.*ppp* provides specific information about the current release of the protocol or protocol toolkit software

The load file, *ppp*load, is in the freeway/boot directory.

For software releases prior to June 1, 1998, the executable object for the protocol or protocol toolkit software, *ppp*_fw_2424.mem[1], *ppp*_fw_2432.mem[3], *ppp*_fw_6000.mem[2], was distributed in the freeway/icpcode/icp*xxxx*/protocols directory. For releases after June 1, 1998, these files are in the freeway/boot directory.

Source code for the loopback tests is in the freeway/client/test/*ppp* directory.

Source code for the protocol toolkit is in the freeway/icpcode/proto_kit directory.

1. For the example server-resident application, the executable object is sps_fw_2424.mem or sps_fw_2432.mem for Freeway 1100/1150/1200/1300.

2. For the example server-resident application, the executable object is sps_fw_6000.mem for Freeway 2000/4000/8800.

Source code for the OS/Impact delivered with the protocol toolkit is in the freeway/ icp-code/os_sds directory.

2.2.2 Retrieve Files from the UNIX Distribution Media

Use the following procedure to install the Freeway software from the distribution media onto your UNIX computer.

Caution

Remember that installing new software overwrites the previous software.

Step 1: On the boot server (previously configured as described in Section 2.1), log in to a root or other privileged account.

Step 2: Change to the default directory called /usr/local. The installation procedure is designed to use this default directory and the directory structure under it.

Note

It is highly recommended that you use the default directory structure. If you install the software in a non-default directory, you must later modify certain files as described in Section 2.5.

Note

If you are also installing the Wind River Systems' Tornado software required by the example server-resident application and the Server Toolkit, we recommend that you install it in the default /usr/wind directory. See the *VxWorks Programmer's Guide* for further information. If you install the Tornado software in a non-default directory, you must later modify certain files as described in Step 2 of Section 2.2.6 on page 50.

Step 3: Insert the protocol or toolkit distribution media into the appropriate drive. For CD-ROM distributions, follow the instructions in Section 2.2.2.1. For tar format distributions, follow the instructions in Section 2.2.2.2. For cpio format distributions, follow the instructions in Section 2.2.2.3. Insert the server/client distribution media and retrieve the files in the same manner. If you have purchased the optional Server Toolkit product, insert the Server Toolkit distribution media and again retrieve the files in the same manner. The files will be copied from the distribution media into a directory called freeway.

2.2.2.1 CD-ROM Distributions

Insert the CD into the drive. Open the readme.txt file on the CD-ROM and follow the instructions.

2.2.2.2 TAR Format Distributions

If the files on your distribution media are in tar format, use the tar x command to retrieve them. You might want to include the v option to display the file names as they are extracted. Some systems require that you use the f option to identify the peripheral device being used.

Here are two examples of the tar command (the device name on your system might be different):

```
tar xv
tar xvf /dev/rst0
```

The tar command creates a directory called freeway in the /usr/local directory and copies the software into it from the distribution media.

Go to Section 2.2.8 for the next step in the installation procedure.

2.2.2.3 CPIO Format Distributions

If the files on your distribution media are in cpio format, use the cpio command to retrieve them. Here is an example of the cpio command (the device on your system might be different):

```
cpio -ivduBm < /dev/rst0
```

The cpio command creates a directory called freeway in the /usr/local directory and copies the software into it from the distribution media.

2.2.3 Modify the Boot and Load Files

Edit the boot configuration and load files to match your Freeway setup.

Your Freeway can be set up to use both physical ICP boards and virtual ICP devices. (Virtual ICPs, or ICP_IP devices, behave just like physical ICP boards except that they transmit and receive data via an IP network rather than via a serial line.) You must modify one freeway/boot/bootcfg file to include all the information needed.

If you are only using physical ICP boards, edit the boot configuration and load files to match your Freeway setup as described in this section. For further information about the boot configuration file, see Section 3.2.

If you are only using virtual ICP devices (ICP_IP), edit the bootcfg.ip configuration file as described in Section 3.2.1 on page 108.

If you are using both physical ICP boards and virtual ICP devices, modify one freeway/boot/bootcfg file to include all the information needed for each of the physical devices (ICP boards, described in this section) and virtual devices (ICP_IP devices, described in Section 3.2.1 on page 108) in your system. Be sure that only one instance of each device_name is used in this file.

The download_script parameter in the boot configuration file defines the path name of the load file. The load file contains the commands that download the protocol or protocol toolkit software to the ICP.

cd /usr/local/freeway/boot

Step 1: Edit the boot file **(bootcfg.*xxx*)**

For a Freeway 1100 with both ICP2424 and ICP2432 boards installed, merge the bootcfg.isa and bootcfg.pci files to form a new configuration file, including the physical parameters for each ICP installed in your Freeway. Be sure that only one instance of each device_name is used in this file.

Edit the boot configuration file (freeway/boot/bootcfg.*xxx*[1]) as follows:

1. Uncomment the physical parameters associated with each ICP in your Freeway.

2. For all Freeways, modify the slave_address entry of each ICP to match your configuration. For Freeway 1150/1200/1300, also modify the bus_number entry of each ICP. Appropriate slave addresses (and bus numbers where applicable) are shown in a table at the beginning of the boot configuration file.

3. Modify the name of the load file in each download_script entry to match your protocol or toolkit (for example, x25load or sraload).

4. If you have moved the load file from the boot directory, enter the path name for the load file in each download_script entry. If no path name is provided in the download_script entry, Freeway searches the System Boot Directory specified in the Freeway System Boot Parameters menu (Figure 4–27 on page 149) for the load file indicated.

1. Freeway 1100 uses bootcfg.isa (ICP2424) or bootcfg.pci (ICP2432). Freeway 1150/1200/1300 uses bootcfg.pci. Freeway 2000/4000/8800 uses bootcfg.vme. Any Freeway using ICP_IP virtual ICP devices may use bootcfg.ip.

5. If you will be using the server-resident application (SRA), uncomment the lines sra_module = sra*xxx*.o[1] and sra_entry = sraInit to load and run the example SRA software at boot time. Also modify the tsi_config_file parameter to use the muxcfg.sra file.

Step 2: Edit the load file (***ppp*load**)

Freeway server release G (and later) installs the XIO image files in the freeway/boot directory. Prior to June 1, 1998, the XIO image files were distributed in the freeway/icp-code/icp*xxxx*/osimpact directory. As a result, the load files provided with protocols with a release date prior to June 1, 1998 contain a fully qualified path for the protocol and XIO image files. Such files should be modified to remove the path to the XIO image. This allows the Freeway to boot the local copy of the XIO image provided in the boot directory with the current Freeway server release.

Edit the load file (freeway/boot/*ppp*load) for your protocol or toolkit as follows:

1. Uncomment the lines associated with the type of ICP in your Freeway.

2. Modify path names as needed. If no path name is provided, Freeway searches the System Boot Directory specified in the Freeway System Boot Parameters menu (Figure 4–27 on page 149) for the file to be loaded.

3. Do not change the memory locations (such as 40001200) for the LOAD commands.

For example, to modify the bscload file to load the BSC protocol on an ICP6000, uncomment the lines associated with the ICP6000 as shown in Figure 2–2.

1. *xxx* = 486 for Freeway1100/1150/1200/1300, 68K for a Freeway 2000/4000/8800 with an MVME 162 CPU, or ppc for a Freeway 2000/4000/8800 with an MVME 2600 CPU.

```
# the below is an example for the icp2424
#
#LOAD xio_2424.mem          801200
#LOAD bsc3270_fw_2424.mem    818000
#LOAD bsc3780_fw_2424.mem    849000
#INIT                  818000
#
# the below is an example for the icp2432
#
#LOAD xio_2432.mem          801200
#LOAD bsc3270_fw_2432.mem    818000
#LOAD bsc3780_fw_2432.mem    849000
#INIT                  818000
#
# the below is an example for the icp6000
#
LOAD xio_6000.mem         40001200
LOAD bsc3270_fw_6000.mem  40018000
LOAD bsc3780_fw_6000.mem  40049000
INIT                40018000
```

Figure 2–2: Sample Load File for ICP6000

2.2.4 Build the DLI and TSI Files

Build the DLI and TSI files needed by the Freeway software. A make file is included that performs this operation.

Step 1: Create the **bin** and **lib** directories

1. If it doesn't already exist, create the *op-sys* directory, where *op-sys* is the identifier for the operating system you are using: dec, hpux, sgi, solaris, or sunos.

   cd /usr/local/freeway/client
   mkdir *op-sys*

2. From your *op-sys* directory, create the bin and lib directories if they don't already exist.

   cd *op-sys*
   mkdir bin
   mkdir lib

Step 2: Run the make file

From the freeway/lib directory, enter one of the following commands depending on the system you are using. The newly created files will be placed in the proper freeway/client/*op-sys*/bin or freeway/client/*op-sys*/lib directory.

cd /usr/local/freeway/lib	
make -f Makefile.DEC all	(for a DEC UNIX system)
make -f Makefile.HPUX all	(for an HP/UX system)
make -f Makefile.SGI all	(for an SGI system)
make -f Makefile.SOL all	(for a Solaris system)
make -f Makefile.SUN all	(for a SunOS system)

2.2.5 Build the CS API Library File

If you are using the X.25 protocol, you must build the CS API library file needed by the Freeway software. A make file is included that performs this operation.

From the freeway/lib/cs_api directory, enter one of the following commands depending on the system you are using. The newly created file will be placed in the freeway/client/*op-sys*/lib directory.

cd /usr/local/freeway/lib/cs_api	
make -f makefile.dec all	(for a DEC UNIX system)
make -f makefile.hpux all	(for an HP/UX system)
make -f makefile.sgi all	(for an SGI system)
make -f makefile.sol all	(for a Solaris system)
make -f makefile.sun all	(for a SunOS system)

2.2.6 Compile the Example Server-Resident Application

To build the example SRA, you must have installed a GNU cross compiler compatible with the target CPU in your Freeway. It is recommended that you use the GNU cross compiler provided with the Wind River Systems Tornado tool set. The target CPU-specific portion of the Tornado tool set is called the Board Support Package (BSP). To use the GNU cross compiler provided with Tornado, you must have purchased the appropriate BSP for your Freeway. The pc486 BSP is required for Freeway 1100/1150/1200/1300, the mv162 BSP is required for a Freeway 2000/4000/8800 with an MVME 162 CPU, and the mv2604 BSP is required for a Freeway 2000/4000/8800 with an MVME 2600 CPU.

If you are using a GNU compiler that is not part of a Tornado distribution, you must make several modifications to the environment files and make files used to build your SRA. See the *Freeway Server Software Toolkit Programmer's Guide* for further information on building the SRA without the Tornado distribution.

Compile the example SRA code using the provided make files.

Step 1: Edit **freeway/envcom**

If you installed the Freeway server software in a directory other than /usr/local, modify the path assigned to FWBASE in the freeway/envcom file.

Step 2: Edit **freeway/[env486**, **env68k**, or **envppc]**

If you are using the GNU tool set distributed with Tornado to compile your SRA, and you installed Tornado in a directory other than /usr/wind, modify the path assigned to WIND_BASE in the freeway/env486 file (Freeway 1100/1150/1200/1300), freeway/env68k file (Freeway 2000/4000/8800 with an MVME 162 CPU), or freeway/envppc file (Freeway 2000/4000/8800 with an MVME 2600 CPU).

Step 3: Run the make file

From the freeway directory, enter one of the make commands listed below. This compiles all the necessary source code and links the object files to form the SRA object module, which is then placed in the freeway/boot directory. The name of the object module generated is sra486.o for Freeway 1100/1150/1200/1300, sra68K.o for a Freeway 2000/4000/8800 with an MVME 162 CPU, or srappc.o for a Freeway 2000/4000/8800 with an MVME 2600 CPU.

Your make command must reference the GNU make utility. If the GNU make is not the first make command in your path, use a full path name to the GNU command, make an alias to the GNU command, or modify your path appropriately.

cd /usr/local/freeway

For Freeway 1100/1150/1200/1300:

/usr/wind/host/sun4-solaris2/bin/make -f MakeSRA.I486 clean all

For a Freeway 2000/4000/8800 with an MVME 162 CPU:

/usr/wind/host/sun4-solaris2/bin/make -f MakeSRA.68K clean all

For a Freeway 2000/4000/8800 with an MVME 2600 CPU:

/usr/wind/host/sun4-solaris2/bin/make -f MakeSRA.ppc clean all

Remember to modify the boot configuration file as indicated in Section 2.2.3 on page 47 to tell Freeway to load and run the example SRA at boot time and to use muxcfg.sra as the transport subsystem interface (TSI) configuration file.

Because the example SRA runs the loopback test automatically when Freeway is booted, install a three-headed loopback cable between links 0 and 1 of ICP 0 and a synchronous modem before continuing to Section 2.5 on page 93.

2.2.7 Compile the Server Toolkit

To build a customized Freeway image using the optional Server Toolkit product, you must have purchased and installed Tornado from Wind River Systems with the appropriate Board Support Package (BSP) for your Freeway. The pc486 BSP is required for Freeway 1100/1150/1200/1300, the mv162 BSP is required for a Freeway 2000/4000/8800 with an MVME 162 CPU, and the mv2604 BSP is required for a Freeway 2000/4000/8800 with an MVME 2600 CPU. Your Tornado installation must match the version of Tornado used by Protogate to build the Freeway server product. See the Server Toolkit release notes for the current version of Tornado required for building the Toolkit.

Caution

When building the Server Toolkit, the Freeway and VxWorks images in the freeway/boot directory are overwritten. Before executing the make instructions for the Server Toolkit, be sure to archive the original copies of these files that were delivered with the Freeway and Server Toolkit distributions so they can be easily restored.

Compile the Server Toolkit using the provided make files.

Step 1: Edit freeway/envcom. If you installed the server toolkit software in a directory other than /usr/local, modify the path assigned to FWBASE in the freeway/envcom file.

Step 2: Edit freeway/[env486, env68k, or envppc]. If you installed Tornado in a directory other than /usr/wind, modify the path assigned to WIND_BASE in the freeway/env486 file (Freeway 1100/1150/1200/1300), freeway/env68k file (Freeway 2000/4000/8800 with an MVME 162 CPU) or freeway/envppc file (Freeway 2000/4000/8800 with an MVME 2600 CPU).

Step 3: Run the make file.

From the freeway directory, enter one of the following commands. This compiles all the necessary source code from the VxWorks Board Support Package as modified by Protogate and links the object files with the Freeway server library, the Freeway API library, and the VxWorks system library to build the Freeway server image, VxWorks image, and loadable Freeway server module for the specified Freeway architecture and place them in the freeway/boot directory. Your make command must reference the GNU make utility. If the GNU make is not the first make command in your path, use a full path name to the GNU command, make an alias to the GNU command, or modify your path appropriately.

For Freeway 1100/1150/1200/1300:

/usr/wind/host/sun4-solaris2/bin/make -f MakeSTK.I486 clean all

For a Freeway 2000/4000/8800 with an MVME 162 CPU:

/usr/wind/host/sun4-solaris2/bin/make -f MakeSTK.68K clean all

For a Freeway 2000/4000/8800 with an MVME 2600 CPU:

/usr/wind/host/sun4-solaris2/bin/make -f MakeSTK.ppc clean all

2.2.8 Build the Loopback Tests

For all protocols and toolkits except the example server-resident application, you must build the loopback tests supplied with the Freeway software. A make file is included that performs this operation.

Step 1: Edit the client TSI configuration files in **freeway/client/test/*ppp***

For all protocols and toolkits except the example server-resident application, edit each of the client transport subsystem interface (TSI) configuration files listed in Table 2–3,

changing the default value of the Freeway server parameter, freeway_0, to the name (or Internet address) of your current Freeway server.

A client TSI configuration file might reference the **server** parameter more than once, and must be changed at each occurrence.

Note

If the server name and Internet address have not already been added to the /etc/hosts file during hardware installation, refer to Section 2.1.3 on page 34.

Note

There is a separate *server* TSI configuration file, usually called muxcfg, that does not require modification for most sites.

Table 2–3: Client TSI Configuration Files (UNIX)

AUTODIN	AWS	BSC3270	BSC2780/3780
autodinaltcfg	awsaltcfg	bsc3270altcfg	bsc3780altcfg
DDCMP	FMP	ADCCP NRM	Protocol Toolkit
ddcmpaltcfg	fmpaltcfg	nrmaltcfg	spsaltcfg
STD1200B	Military/Government Protocol	X.25/HDLC	
s12altcfg	miltcfg	apitcfg	

Step 2: Edit the DLI configuration files (Freeway 1100/1150/1200/1300) in **freeway/client/test/*ppp***

If you are installing any protocol on Freeway 2000/4000/8800, skip to Step 3.

If you are installing DDCMP, protocol toolkit, or X.25 on Freeway 1100/1150/1200/1300, skip to Step 3. The electrical interface for DDCMP and protocol toolkit is specified when you run the loopback test. The electrical interface for X.25 is specified in the .setup file in the freeway/client/test/x25mgr directory.

If you are installing AWS, BSC, or FMP on Freeway 1100/1150/1200/1300, change to the freeway/client/test/*ppp* directory. Specify the electrical interface by editing the data link interface (DLI) configuration files listed in Table 2–4.

Open each file and locate each occurrence of ElecInterface. Remove the double slashes (//) from the beginning of each ElecInterface line. If you will not be using the default EIA-232 electrical interface, replace EIA232 with one of the following:

- EIA449
- EIA530
- V35

Table 2–4: Client DLI Configuration Files (UNIX)

AWS	BSC3270	BSC2780/3780	FMP
awsaldcfg	bsc3270aldcfg	bsc3780aldcfg	fmpaldcfg

Step 3: Run the make file

From the freeway/client/test/*ppp* directory, enter one of the following commands depending on the system you are using. The newly created files will be placed in the freeway/client/*op-sys*/bin directory.

make -f makefile.dec all (for a DEC UNIX system)
make -f makefile.hpux all (for an HP/UX system)
make -f makefile.sgi all (for an SGI system)

make -f makefile.sol all	(for a Solaris system)
make -f makefile.sun all	(for a SunOS system)

Go to Section 2.5 on page 93 for the next step in the installation procedure. For a description of the Freeway files you have just installed onto your boot server, refer to Appendix B.

2.3 Install the Freeway Software onto a VMS Computer

This section describes how to install the Freeway software from the distribution media onto a VMS computer. Later in these procedures you will use this computer as a boot server to boot Freeway.

Note

After you have followed the detailed software installation procedures outlined in this chapter, you can refer to the "Installation at a Glance" summary in Appendix A as a quick reference for future installations.

2.3.1 Contents of the VMS Distribution Media

The Freeway software for VMS computers is distributed on a TK50/TK70 cartridge in Files-11 format.

2.3.1.1 Server/Client Software

The server/client distribution media is labeled Freeway Server Software.

The following files are in the FREEWAY directory:

- README.SER provides general information about the server software
- RELNOTES.SER provides specific information about the current release of the server software
- The ENV and MAKE files are for the example server-resident application, which is not available on VMS

The following general files are in the FREEWAY.BOOT directory:

- BOOTCFG.IP is an example boot configuration file for ICP_IP virtual devices
- BOOTCFG.ISA is the boot configuration file for a Freeway 1100 with ICP2424s (ISAbus boards)
- BOOTCFG.PCI is the boot configuration file for a Freeway 1100 with ICP2432s (PCI boards) and Freeway 1150/1200/1300
- BOOTCFG.VME is the boot configuration file for Freeway 2000/4000/8800s
- FW486 is the system boot file for Freeway 1100/1150/1200/1300
- FW162 is the standard system boot file for a Freeway 2000/4000/8800 with an MVME 162 CPU 9 or CPU 10
- FW162L is the limited memory system boot file for a Freeway 2000/4000/8800 with an MVME 162 CPU 7 or CPU 8
- FW2604 is the system boot file for a Freeway 2000/4000/8800 with an MVME 2600 CPU
- FW486.SYM is the symbol table for the Freeway 1100/1150/1200/1300 boot image
- FW162.SYM is the standard symbol table for the boot image of a Freeway 2000/4000/8800 with an MVME 162 CPU 9 or CPU 10
- FW162L.SYM is the limited memory symbol table for the boot image of a Freeway 2000/4000/8800 with an MVME 162 CPU 7 or CPU 8
- FW2604.SYM is the symbol table for the boot image of a Freeway 2000/4000/8800 with an MVME 2600 CPU
- MUXCFG[1] is the server TSI configuration file

1. The Military/Government protocol uses MILMUXCFG.

- XIO_2424.MEM XIO_2432.MEM, or XIO_6000.MEM[1] are the executable objects for the system-services module

Various files specific to the server-resident application (SRA), such as buffer.size, ftst, and the sra files, are also in the FREEWAY.BOOT directory; however, SRA is not available on VMS.

The data link interface (DLI) and transport subsystem interface (TSI) software is in the FREEWAY.LIB directory.

2.3.1.2 Protocol or Protocol Toolkit Software

The protocol or protocol toolkit distribution media is labeled Freeway *[Name]* Software.

Note

The *ppp* variable mentioned below specifies the particular protocol or toolkit you are using (refer to Table 2–2 on page 31).

The following files are in the FREEWAY directory:

- README.*ppp* provides general information about the protocol or protocol toolkit software
- RELNOTES.*ppp* provides specific information about the current release of the protocol or protocol toolkit software

The load file, *ppp*LOAD, is in the FREEWAY.BOOT directory.

1. The Freeway server release G (and later) installs the XIO image files in the FREEWAY.BOOT directory. Prior to June 1, 1998, the XIO image files were distributed in the FREEWAY.ICP-CODE.ICP*XXXX*.OSIMPACT directory. As a result, the load files provided with protocols with a release date prior to June 1, 1998 contain a fully qualified path for the protocol and XIO image files. Such files should be modified to remove the path to the XIO image. This allows Freeway to boot the local copy of the XIO image provided in the FREEWAY.BOOT directory with the current Freeway server release.

For software releases prior to June 1, 1998, the executable object for the protocol or protocol toolkit software, *ppp*_FW_2424.MEM[1], *ppp*_FW_2432.MEM[9], *ppp*_FW_6000.MEM[2], was distributed in the FREEWAY.ICPCODE.ICP*XXXX*.PROTOCOLS directory. For releases after June 1, 1998, these files are in the FREEWAY.BOOT directory.

Source code for the loopback tests is in the FREEWAY.CLIENT.TEST.*ppp* directory.

Source code for the protocol toolkit is in the FREEWAY.ICPCODE.PROTO_KIT directory.

Source code for the OS/Impact delivered with the protocol toolkit is in the FREEWAY.ICPCODE.OS_SDS directory.

2.3.2 Retrieve Files from the VMS Distribution Media

The software distribution media contains several VMS BACKUP savesets. To install the Freeway software from the distribution media onto your VMS computer, use the VMSINSTAL utility as described in the following procedure.

Caution

Remember that installing new software overwrites the previous software.

After the distribution media is mounted, the procedure is automated and only requires that you respond to menu prompts. Console displays are shown in typewriter type and your responses are shown in bold type. Follow each entry with a carriage return. The abbreviation **ddcu** signifies that a device name is required.

1. For the example server-resident application, the executable object is SPS_FW_2424.MEM or SPS_FW_2432.MEM for Freeway 1100/1150/1200/1300.

2. For the example server-resident application, the executable object is SPS_FW_6000.MEM for Freeway 2000/4000/8800.

You might find it useful to perform the installation at a hardcopy terminal. This provides a printed record that you can use for troubleshooting if needed.

Step 1: On the boot server (previously configured as described in Section 2.1), log in to an account that has system-manager privileges.

Step 2: Change to the default directory called SYS$SYSDEVICE. The installation procedure is designed to use this default directory and the directory structure under it.

Note

It is highly recommended that you use the default directory structure. If you install the software in a non-default directory, you must later modify certain files as described in Section 2.5.

Step 3: Insert the protocol distribution media into the appropriate drive. Run VMSINSTAL as follows to copy the files from each distribution media to your VMS computer (V*nnnn* is the current software version number). Then insert the server/client distribution media and retrieve the files in the same manner.

```
$ @SYS$UPDATE:VMSINSTAL

OpenVMS VAX Software Product Installation Procedure Vnnnn

It is today's date at current time.

Enter a question mark (?) at any time for help.
```

The computer checks the following conditions:

- Are you logged in to the system manager's account? You should install the software from that account; however, any account with the necessary privileges is acceptable.

- Do you have adequate account quotas for installing software? VMSINSTAL checks for the various quota values.
- Is DECnet up and running? (This is only checked by older versions of VMSINSTAL.)
- Are any users logged on the system? Problems might occur if someone tries to use Freeway while you are installing a new release of the software.

Step 4: If there are potential problems with the account quotas, the computer displays:

```
The following account quotas may be too low.
```

The computer lists the account quotas that might be too low. Next, it lists any other active processes.

If any potentially conflicting conditions are noted, the computer gives you the opportunity to stop the installation by displaying the following message:

```
* Do you want to continue anyway [NO]?
```

If you answer **yes**, the computer asks:

```
Are you satisfied with the backup of your system disk [YES]?
```

If you answer **no**, the installation stops so you can save your data before restarting the installation.

Step 5: If you proceed with the installation, the computer displays the following message. Remember that **ddcu** means a device name.

```
* Where will the distribution volumes be mounted: ddcu:
```

For **ddcu**, substitute a device name such as MUA0, MKA100, DUAl, or something similar.

Step 6: The computer displays:

```
Enter the products to be processed from the first distribution
volume set.

* Products: *
```

Enter an asterisk (this causes all products to be installed).

Step 7: Depending on the release number, you will see either

```
* Enter installation options you wish to use (none):
```

or

```
* Options:
```

Refer to Digital's *VMS Installation Guide* for a list of the VMSINSTAL options and how to enter them. Press <return> to select the standard installation options.

Step 8: The computer displays:

```
Please mount the first volume of the set on ddcu:
```

Note that **ddcu** is the device name you entered in Step 5.

Step 9: Mount the distribution media. The computer asks:

```
* Are you ready? y
```

Answer yes by entering **y** followed by <return>. The computer displays a mount message. Depending on the speed of your system, several minutes will pass before the next message is displayed.

The following products will be processed:

The computer displays product names, then displays the following (V*nnnn* is the current software version number):

Beginning installation of *Product Vnnnn* at *current time*.
%VMSINSTAL-I-RESTORE Restoring product save set A ...

The computer displays other verification messages.

Caution

The next two steps ask you to specify the disk and directory locations where the software will be installed. *It is highly recommended that you use the default locations.* If you do not, you must later modify certain files as described in Section 2.5.

Step 10: The computer displays:

This installation procedure will place the files on device
SYS$SYSDEVICE.

* Is this acceptable [Y]? y

Press <return> to answer yes (*this is highly recommended*). If you answer **no**, you are prompted to enter the name of a target disk.

Step 11: The computer displays:

This installation procedure will place the product files in
directory [FREEWAY...]
on device *ddcu*

* Is this acceptable [Y]? y

Remember that **ddcu** means a device name. Press <return> to answer yes (*this is highly recommended*). If you answer **no**, you are prompted to enter the name of a directory.

Step 12: The computer displays:

```
There are no more questions. The installation will proceed.
```

The procedure completes automatically without the need for you to take any action. Depending on the speed of your system, this will take several minutes.

While moving the files to the appropriate directory, the computer displays the README file that includes configuration information such as the part, version, and serial numbers for the distribution, then it displays:

```
%VMSINSTAL-I-MOVEFILES, Files will now be moved to their target directories...

Installation of Product Vnnnn completed at current time.
```

Step 13: The computer displays:

```
Enter the products to be processed from the next distribution volume set.

* Products:
```

If you will be installing another protocol, enter an asterisk (*) to continue. When there are no other distribution sets, enter **exit**. The computer displays:

```
VMSINSTAL procedure done at current time.
```

The Freeway software is now installed onto your computer's disk.

2.3.3 Modify the Boot and Load Files

Edit the boot configuration and load files to match your Freeway setup.

Your Freeway can be set up to use both physical ICP boards and virtual ICP devices. (Virtual ICPs, or ICP_IP devices, behave just like physical ICP boards except that they transmit and receive data via an IP network rather than via a serial line.) You must modify one [FREEWAY.BOOT]BOOTCFG file to include all the information needed.

If you are only using physical ICP boards, edit the boot configuration and load files to match your Freeway setup as described in this section. For further information about the boot configuration file, see Section 3.2.

If you are only using virtual ICP devices (ICP_IP), edit the BOOTCFG.IP configuration file as described in Section 3.2.1 on page 108.

If you are using both physical ICP boards and virtual ICP devices, modify one [FREEWAY.BOOT]BOOTCFG file to include all the information needed for each of the physical devices (ICP boards, described in this section) and virtual devices (ICP_IP devices, described in Section 3.2.1 on page 108) in your system. Be sure that only one instance of each device_name is used in this file.

The download_script parameter in the boot configuration file defines the path name of the load file. The load file contains the commands that download the protocol or protocol toolkit software to the ICP.

SET DEF SYS$SYSDEVICE:[FREEWAY.BOOT]

Step 1: Edit the boot file **(bootcfg.*xxx*)**

For a Freeway 1100 with both ICP2424 and ICP2432 boards installed, merge the BOOTCFG.ISA and BOOTCFG.PCI files to form a new configuration file, including the physical parameters for each ICP installed in your Freeway. Be sure that only one instance of each device_name is used in this file.

Edit the boot configuration file ([FREEWAY.BOOT]BOOTCFG.*xxx*[1]) as follows:

1. Uncomment the physical parameters associated with each ICP in your Freeway.

2. For all Freeways, modify the slave_address entry of each ICP to match your configuration. For Freeway 1150/1200/1300, also modify the bus_number entry of each ICP. Appropriate slave addresses (and bus numbers where applicable) are shown in a table at the beginning of the boot configuration file.

3. Modify the name of the load file in each download_script entry to match your protocol or toolkit (for example, X25LOAD or AWSLOAD).

4. If you have moved the load file from the BOOT directory, enter the path name for the load file in each download_script entry. If no path name is provided in the download_script entry, Freeway searches the System Boot Directory specified in the Freeway System Boot Parameters menu (Figure 4–27 on page 149) for the load file indicated.

1. Freeway 1100 uses BOOTCFG.ISA (ICP2424) or BOOTCFG.PCI (ICP2432). Freeway 1150/1200/1300 uses BOOTCFG.PCI. Freeway 2000/4000/8800 uses BOOTCFG.VME. Any Freeway using ICP_IP virtual ICP devices may use BOOTCFG.IP.

Step 2: Edit the load file **(*ppp*LOAD)**

Freeway server release G (and later) installs the XIO image files in the FREEWAY.BOOT directory. Prior to June 1, 1998, the XIO image files were distributed in the FREEWAY.ICPCODE.ICP*XXXX*.OSIMPACT directory. As a result, the load files provided with protocols with a release date prior to June 1, 1998 contain a fully qualified path for the protocol and XIO image files. Such files should be modified to remove the path to the XIO image. This allows the Freeway to boot the local copy of the XIO image provided in the BOOT directory with the current Freeway server release.

Edit the load file ([FREEWAY.BOOT]*ppp*LOAD) for your protocol or toolkit as follows:

1. Uncomment the lines associated with the type of ICP in your Freeway.
2. Modify path names as needed. If no path name is provided, Freeway searches the System Boot Directory specified in the Freeway System Boot Parameters menu (Figure 4–27 on page 149) for the file to be loaded.
3. Do not change the memory locations (such as 40001200) for the LOAD commands.

For example, to modify the BSCLOAD file to load the BSC protocol on an ICP2432, uncomment the lines associated with the ICP2432 as shown in Figure 2–3.

```
# the below is an example for the icp2424
#
#LOAD xio_2424.mem          801200
#LOAD bsc3270_fw_2424.mem    818000
#LOAD bsc3780_fw_2424.mem    849000
#INIT                       818000
#
# the below is an example for the icp2432
#
LOAD xio_2432.mem          801200
LOAD bsc3270_fw_2432.mem    818000
LOAD bsc3780_fw_2432.mem    849000
INIT                       818000
#
# the below is an example for the icp6000
#
#LOAD xio_6000.mem         40001200
#LOAD bsc3270_fw_6000.mem   40018000
#LOAD bsc3780_fw_6000.mem   40049000
#INIT                      40018000
```

Figure 2–3: Sample Load File for ICP2432

2.3.4 Build the DLI and TSI Files

Build the DLI and TSI files needed by the Freeway software. A make command is included that performs this operation.

Step 1: Create the **BIN** and **LIB** directories

1. If it doesn't already exist, create the *OP-SYS* directory, where *OP-SYS* is the identifier for the operating system you are using: AXP_MULTINET, AXP_TCPWARE, or AXP_UCX.

   SET DEF SYS$SYSDEVICE:[FREEWAY.CLIENT]
   CREATE /DIR [.*OP-SYS***]**

2. From your *OP-SYS* directory, create the BIN and LIB directories if they don't already exist.

   SET DEF *OP-SYS*
   CREATE /DIR [.BIN]
   CREATE /DIR [.LIB]

Step 2: Run the **MAKE_DLI_TSI** command

From the FREEWAY.LIB directory, enter one of the following commands. The newly created files will be placed in the proper FREEWAY.CLIENT.*OP-SYS*.BIN or FREEWAY.CLIENT.*OP-SYS*.LIB directory.

SET DEF SYS$SYSDEVICE[FREEWAY.LIB]

@MAKE_DLI_TSI "" MULTINET	**(for VMS with Multinet)**
@MAKE_DLI_TSI "" TCPWARE	**(for VMS with TCPware)**
@MAKE_DLI_TSI "" UCX	**(for VMS with UCX)**

2.3.5 Build the CS API Library File

If you are using the X.25 protocol, you must build the CS API library file needed by the Freeway software. A make command is included that performs this operation.

From the FREEWAY.LIB.CS_API directory, enter one of the following commands. The newly created file will be placed in the FREEWAY.CLIENT.*OP-SYS*.LIB directory.

SET DEF SYS$SYSDEVICE[FREEWAY.LIB.CS_API]

@MAKEVMS "" MULTINET	(for VMS with Multinet)
@MAKEVMS "" TCPWARE	(for VMS with TCPware)
@MAKEVMS "" UCX	(for VMS with UCX)

2.3.6 Build the QIO/SQIO API Library File

If you have purchased the QIO/SQIO API, you must build the library file needed by the Freeway software. A make command is included that performs this operation.

From the FREEWAY.LIB.QAPI directory, enter one of the following commands. The newly created file will be placed in the FREEWAY.CLIENT.*OP-SYS*.LIB directory.

SET DEF SYS$SYSDEVICE[FREEWAY.LIB.QAPI]

@MAKEVMS "" MULTINET	(for VMS with Multinet)
@MAKEVMS "" TCPWARE	(for VMS with TCPware)
@MAKEVMS "" UCX	(for VMS with UCX)

2.3.7 Build the Loopback Tests

You must build the loopback tests supplied with the Freeway software. A command file called MAKEVMS.COM is included that performs these operations.

Step 1: Edit the client TSI configuration files in **FREEWAY.CLIENT.TEST.*ppp***

Edit each of the client transport subsystem interface (TSI) configuration files listed in Table 2–5, changing the default value of the Freeway server parameter, freeway_0, to the name (or Internet address) of your current Freeway server.

A client TSI configuration file might reference the **server** parameter more than once, and must be changed at each occurrence.

Note

If the server name and Internet address have not already been defined during hardware installation, refer to Section 2.1.3 on page 34.

Note

There is a separate *server* TSI configuration file, usually called MUXCFG, which does not require modification for most sites.

Table 2–5: Client TSI Configuration Files (UNIX)

AUTODIN	AWS	BSC3270	BSC2780/3780
AUTODINAL-TCFG	AWSALTCFG	BSC3270ALTCFG	BSC3780ALTCFG
DDCMP	FMP	ADCCP NRM	Protocol Toolkit
DDCMPALTCFG	FMPALTCFG	NRMALTCFG	SPSALTCFG
STD1200B	Military/Government Protocol	X.25/HDLC	
S12ALTCFG	MILTCFG	APITCFG	

Step 2: Edit the DLI configuration files (Freeway 1100/1150/1200/1300) in **FREEWAY. CLIENT.TEST.*ppp***

If you are installing any protocol on Freeway 2000/4000/8800, skip to Step 3 on page 73.

If you are installing DDCMP, protocol toolkit, or X.25 on Freeway 1100/1150/1200/1300, skip to Step 3 on page 73. The electrical interface for DDCMP and protocol toolkit is specified when you run the loopback test. The electrical interface for X.25 is specified in the .SETUP file in the [FREEWAY.CLIENT.TEST.X25MGR] directory.

If you are installing AWS, BSC, or FMP on Freeway 1100/1150/1200/1300, you must specify the electrical interface by editing the data link interface (DLI) configuration files listed in Table 2–6.

Open each file and locate each occurrence of ElecInterface. Remove the double slashes (//) from the beginning of each ElecInterface line. If you will not be using the default EIA-232 electrical interface, replace EIA232 with one of the following:

- EIA449
- EIA530
- V35

Table 2–6: Client DLI Configuration Files (VMS)

AWS	BSC3270	BSC2780/3780	FMP
AWSALDCFG	BSC3270ALDCFG	BSC3780ALDCFG	FMPALDCFG

Step 3: Run the MAKEVMS command

From the FREEWAY.CLIENT.TEST.*ppp* directory, enter one of the following commands. The newly created files will be placed in the FREEWAY.CLIENT.*OP-SYS*.BIN directory.

@MAKEVMS "" MULTINET	(for VMS with Multinet)
@MAKEVMS "" TCPWARE	(for VMS with TCPware)
@MAKEVMS "" UCX	(for VMS with UCX)

Depending on the speed of your system, this will take several minutes.

Note

The installed files have an owner User Identification Code (OWNER_UIC) of [1,4] that corresponds to the SYSTEM account. To be able to access the installed files, you must select (or create) a user account intended to use Freeway and set the ownership of all Freeway files and directories to that particular User Identification Code.

Go to Section 2.5 on page 93 for the next step in the installation procedure. For a description of the Freeway files you have just installed onto your boot server, refer to Appendix B.

2.4 Install the Freeway Software onto a Windows NT Computer

This section describes how to install the Freeway software from the distribution media onto a Windows NT (Alpha or Intel) computer. Later in these procedures you will use this computer as a boot server to boot Freeway.

Note

After you have followed the detailed software installation procedures outlined in this chapter, you can refer to the "Installation at a Glance" summary in Appendix A as a quick reference for future installations.

2.4.1 Contents of the Windows NT Distribution Media

Freeway software for Alpha NT and Intel NT computers is distributed on CD-ROM or on 3.5-inch diskettes.

2.4.1.1 Server/Client Software

The server/client distribution media is labeled Freeway Server Software.

The following files are in the freeway directory:

- readme.ser provides general information about the server software
- relnotes.ser provides specific information about the current release of the server software
- env486, env68k, envcom, and envppc are environment definition files for the example server-resident application (SRA)
- MakeSRA.I486, MakeSRA.68K, and MakeSRA.ppc are make files for the example SRA

The following files are in the freeway\boot directory:

- bootcfg.ip is an example boot configuration file for ICP_IP virtual devices
- bootcfg.isa is the boot configuration file for a Freeway 1100 with ICP2424s (ISA-bus boards)
- bootcfg.pci is the boot configuration file for a Freeway 1100 with ICP2432s (PCI boards) and Freeway 1150/1200/1300
- bootcfg.vme is the boot configuration file for Freeway 2000/4000/8800s
- fw486 is the system boot file for Freeway 1100/1150/1200/1300
- fw162 is the standard system boot file for a Freeway 2000/4000/8800 with an MVME 162 CPU 9 or CPU 10
- fw162l is the limited memory system boot file for a Freeway 2000/4000/8800 with an MVME 162 CPU 7 or CPU 8
- fw2604 is the system boot file for a Freeway 2000/4000/8800 with an MVME 2600 CPU
- fw486.sym is the symbol table for the Freeway 1100/1150/1200/1300 boot image
- fw162.sym is the standard symbol table for the boot image for a Freeway 2000/4000/8800 with an MVME 162 CPU 9 or CPU 10
- fw162l.sym is the limited memory symbol table for the boot image for a Freeway 2000/4000/8800 with an MVME 162 CPU 7 or CPU 8
- fw2604.sym is the symbol table for the boot image of a Freeway 2000/4000/8800 with an MVME 2600 CPU
- muxcfg[1] is the server TSI configuration file

1. The example server-resident application use muxcfg.sra. The Military/Government protocol uses milmuxcfg.

- xio_2424.mem, xio_2432.mem, or xio_6000.mem[1] are the executable objects for the system-services module

The following files specific to the server-resident application (SRA) are also in the freeway\boot directory:

- buffer.size is the buffer size file for the protocol toolkit used with for the example SRA
- ftstdcfg, ftsttcfg, sradcfg, and sratcfg are the data link interface (DLI) and transport subsystem interface (TSI) configuration files for the example SRA
- fw486d is the debug version of the system boot file for Freeway 1100/1150/1200/1300
- fw162d is the standard debug version of the system boot file for a Freeway 2000/4000/8800 with an MVME 162 CPU 9 or CPU 10
- fw2604d is the debug version of the system boot file for a Freeway 2000/4000/8800 with an MVME 2600 CPU
- fw486d.sym is the symbol table for the Freeway 1100/1150/1200/1300 debug server image
- fw162d.sym is the standard symbol table for the debug server image for a Freeway 2000/4000/8800 with an MVME 162 CPU 9 or CPU 10
- fw2604d.sym is the symbol table for the debug server image for a Freeway 2000/4000/8800 with an MVME 2600 CPU

1. The Freeway server release G (and later) installs the XIO image files in the freeway\boot directory. Prior to June 1, 1998, the XIO image files were distributed in the freeway\icpcode\icp*xxxx*\osimpact directory. As a result, the load files provided with protocols with a release date prior to June 1, 1998 contain a fully qualified path for the protocol and XIO image files. Such files should be modified to remove the path to the XIO image. This allows Freeway to boot the local copy of the XIO image provided in the freeway/boot directory with the current Freeway server release.

- sps_fw_2432.mem, sps_fw_6000.mem, and sps_fw_2424.mem are the executable objects for the protocol toolkit used with the example SRA
- sra486.o, sra68K.o, and srappc.o are the object modules for the example SRA
- sraload is the load file for the example SRA
- muxcfg.sra is the server TSI configuration file used with the example SRA

The example SRA source code is in the freeway\client\test\sra directory.

The data link interface (DLI) and transport subsystem interface (TSI) software is in the freeway\lib directory.

2.4.1.2 Server Toolkit Software

The Server Toolkit distribution media is labeled Freeway Server Toolkit Software.

The following files delivered with the Server Toolkit are in the freeway directory:

- readme.stk provides general information about the Server Toolkit software
- relnotes.stk provides specific information about the current release of the Server Toolkit software
- MakeSTK.I486, MakeSTK.68K, and MakeSTK.ppc are make files for the Server Toolkit software

The following files are in the freeway\boot directory:

- vx162, vx486, and vx2604 are VxWorks operating system images
- vx162.sym, vx486.sym, and vx2604.sym are symbol tables for the VxWorks operating system images

A binary object file (usrSimpact.o) providing an entry point for the Freeway software is stored in the freeway\server\bin\mv162, freeway\server\bin\mv2604, and freeway\server\bin\pc486 directories.

The Freeway server software library archive called libserv.a and the server DLI/TSI object library called libvxwfw.o are stored in the freeway\server\lib\mv162, freeway\server\lib\mv2604, and freeway\server\lib\pc486 directories.

Source code that may be modified to tailor the VxWorks operating system of the Freeway server is provided in the freeway\server\vw\config directory.

Make files for rebuilding the server DLI/TSI object library are provided in the freeway\lib directory.

2.4.1.3 Protocol or Protocol Toolkit Software

The protocol or protocol toolkit distribution media is labeled Freeway *[Name]* Software.

Note

The *ppp* variable mentioned below specifies the particular protocol or toolkit you are using (refer to Table 2–2 on page 31).

The following files are in the freeway directory:

- readme.*ppp* provides general information about the protocol or protocol toolkit software
- relnotes.*ppp* provides specific information about the current release of the protocol or protocol toolkit software

The load file, *ppp*load, is in the freeway\boot directory.

For software releases prior to June 1, 1998, the executable object for the protocol or protocol toolkit software, *ppp*_fw_2424.mem[1], *ppp*_fw_2432.mem[14], *ppp*_fw_6000.mem[2], was

1. For the example server-resident application, the executable object is sps_fw_2424.mem or sps_fw_2432.mem for Freeway 1100/1150/1200/1300.

distributed in the freeway\icpcode\icp*xxxx*\protocols directory. For releases after June 1, 1998, these files are in the freeway\boot directory.

Source code for the loopback tests is in the freeway\client\test*ppp* directory.

Source code for the protocol toolkit is in the freeway\icpcode\proto_kit directory.

Source code for the OS/Impact delivered with the protocol toolkit is in the freeway\ icp-code\os_sds directory.

2.4.2 Retrieve Files from the Windows NT Distribution Media

For CD-ROM distributions, see Section 2.4.2.1. For 3.5" diskette distributions, see Section 2.4.2.2.

Caution

Remember that installing new software overwrites the previous software.

2.4.2.1 CD-ROM Distributions

Insert the CD into the drive. If your Windows NT computer is set up for auto-run of CD-ROMs and you have a browser enabled, the installation page will come up automatically. Click on the product you have purchased, then click on Self-extracting Zip/InstallShield and follow the instructions on the screen.

If your Windows NT computer has a browser enabled, but your computer is not set up for auto-run of CD-ROMs, click on the index.html file on the CD-ROM to open the installation page. Click on the product you have purchased, then click on Self-extracting Zip/InstallShield and follow the instructions on the screen.

2. For the example server-resident application, the executable object sps_fw_6000.mem for Freeway 2000/ 4000/8800.

If your Windows NT computer does not have a browser enabled, open the readme.txt file on the CD-ROM and follow the instructions.

2.4.2.2 Diskette Distributions

Use the following procedure to install the Freeway software from the diskettes onto your Alpha NT or Intel NT computer.

Step 1: On the boot server (previously configured as described in Section 2.1), log in to a privileged account.

Step 2: Insert the diskette in the appropriate drive and type:

a:\setup

or

b:\setup

The setup program prompts you for the base directory for the installation. The default directory is C:. Follow the instructions on the screen. When the main prompt appears again, install the next diskette.

2.4.3 Modify the Boot and Load Files

Edit the boot configuration and load files to match your Freeway setup.

Your Freeway can be set up to use both physical ICP boards and virtual ICP devices. (Virtual ICPs, or ICP_IP devices, behave just like physical ICP boards except that they transmit and receive data via an IP network rather than via a serial line.) You must modify one freeway\boot\bootcfg file to include all the information needed.

If you are only using physical ICP boards, edit the boot configuration and load files to match your Freeway setup as described in this section. For further information about the boot configuration file, see Section 3.2.

If you are only using virtual ICP devices (ICP_IP), edit the bootcfg.ip configuration file as described in Section 3.2.1 on page 108.

If you are using both physical ICP boards and virtual ICP devices, modify one freeway\boot\bootcfg file to include all the information needed for each of the physical devices (ICP boards, described in this section) and virtual devices (ICP_IP devices, described in Section 3.2.1 on page 108) in your system. Be sure that only one instance of each device_name is used in this file.

The download_script parameter in the boot configuration file defines the path name of the load file. The load file contains the commands that download the protocol or protocol toolkit software to the ICP.

cd C:\freeway\boot

Step 1: Edit the boot file **(bootcfg.*xxx*)**

For a Freeway 1100 with both ICP2424 and ICP2432 boards installed, merge the bootcfg.isa and bootcfg.pci files to form a new configuration file, including the physical parameters for each ICP installed in your Freeway. Be sure that only one instance of each device_name is used in this file.

Edit the boot configuration file (freeway\boot\bootcfg.*xxx*[1]) as follows:

1. Uncomment the physical parameters associated with each ICP in your Freeway.

2. For all Freeways, modify the slave_address entry of each ICP to match your configuration. For Freeway 1150/1200/1300, also modify the bus_number entry of each ICP. Appropriate slave addresses (and bus numbers where applicable) are shown in a table at the beginning of the boot configuration file.

3. Modify the name of the load file in each download_script entry to match your protocol or toolkit (for example, x25load or sraload).

4. If you have moved the load files from the boot directory, enter the path names for the load files in each download_script entry. If no path name is provided in the download_script entry, Freeway searches the System Boot Directory specified in the Freeway System Boot Parameters menu (Figure 4–27 on page 149) for the load file indicated.

5. If you will be using the server-resident application (SRA), uncomment the lines sra_module = sra*xxx*.o[2] and sra_entry = sraInit to load and run the example SRA software at boot time. Also modify the tsi_config_file parameter to use the muxcfg.sra file.

Step 2: Edit the load file (***ppp*load**)

The Freeway server release G (and later) installs the XIO image files in the freeway\boot directory. Prior to June 1, 1998, the XIO image files were distributed in the freeway\icpcode\icp*xxxx*\osimpact directory. As a result, the load files provided with protocols with a

1. Freeway 1100 uses bootcfg.isa (ICP2424) or bootcfg.pci (ICP2432). Freeway 1150/1200/1300 uses bootcfg.pci. Freeway 2000/4000/8800 uses bootcfg.vme. Any Freeway using ICP_IP virtual ICP devices may use bootcfg.ip.

2. *xxx* = 486 for Freeway1100/1150/1200/1300, 68K for a Freeway 2000/4000/8800 with an MVME 162 CPU, or ppc for a Freeway 2000/4000/8800 with an MVME 2600 CPU.

release date prior to June 1, 1998 contain a fully qualified path for the protocol and XIO image files. Such files should be modified to remove the path to the XIO image. This allows the Freeway to boot the local copy of the XIO image provided in the boot directory with the current Freeway server release.

Edit the load file (freeway\boot*ppp*load) for your protocol or toolkit as follows:

1. Uncomment the lines associated with the type of ICP in your Freeway.
2. Modify path names as needed. If no path name is provided, Freeway searches the System Boot Directory specified in the Freeway System Boot Parameters menu (Figure 4–27 on page 149) for the file to be loaded.
3. Do not change the memory locations (such as 40001200) for the LOAD commands.

For example, to modify the bscload file to load the BSC protocol on an ICP2424, uncomment the lines associated with the ICP2424 as shown in Figure 2–4.

2.4.4 Build the DLI and TSI Files

Build the DLI and TSI files needed by the Freeway software. A make file is included that performs this operation.

Step 1: Create the **bin** and **lib** directories

1. If it doesn't already exist, create the *op-sys* directory, where *op-sys* is the identifier for the operating system you are using: axp_nt or int_nt.

   cd C:\freeway\client
   mkdir *op-sys*

```
# the below is an example for the icp2424
#
LOAD xio_2424.mem          801200
LOAD bsc3270_fw_2424.mem   818000
LOAD bsc3780_fw_2424.mem   849000
INIT                818000
#
# the below is an example for the icp2432
#
#LOAD xio_2432.mem          801200
#LOAD bsc3270_fw_2432.mem   818000
#LOAD bsc3780_fw_2432.mem   849000
#INIT                818000
#
# the below is an example for the icp6000
#
#LOAD xio_6000.mem         40001200
#LOAD bsc3270_fw_6000.mem  40018000
#LOAD bsc3780_fw_6000.mem  40049000
#INIT                40018000
```

Figure 2–4: Sample Load File for ICP2424

2. From your *op-sys* directory, create the bin and lib directories if they don't already exist.

   cd *op-sys*
   mkdir bin
   mkdir lib

Step 2: Run the make file

From the freeway\lib directory, enter the following command. The newly created files will be placed in the proper freeway\client*op-sys*\bin or freeway\client*op-sys*\ lib directory.

cd C:\freeway\lib
makefwy_NT

Step 3: Dynamic link libraries must reside in the current working directory or in a directory specified in your "PATH" environment variable. Do one of the following:

Add C:\freeway\client*op-sys*\lib to your path.

or

Copy the .dll files from C:\freeway\client*op-sys*\lib to your bin directory or to another directory in your path.

2.4.5 Build the CS API Files

If you are using the X.25 protocol, you must build the CS API files needed by the Freeway software. A make file is included that performs this operation.

Step 1: From the freeway\lib\cs_api directory, enter one of the following commands. The newly created file will be placed in the freeway\client*op-sys*\lib directory.

cd C:\freeway\lib\cs_api
nmake -f makefile.ant all (for an Alpha NT system)
nmake -f makefile.int all (for an Intel NT system)

Step 2: Dynamic link libraries must reside in the current working directory or in a directory specified in your "PATH" environment variable. Do one of the following:

Add C:\freeway\client*op-sys*\lib to your path.

or

Copy the .dll files from C:\freeway\client*op-sys*\lib to your bin directory or to another directory in your path.

2.4.6 Compile the Example Server-Resident Application

To build the example SRA, you must have installed a GNU cross compiler compatible with the target CPU in your Freeway. It is recommended that you use the GNU cross compiler provided with the Wind River Systems Tornado tool set. The target CPU-specific portion of the Tornado tool set is called the Board Support Package (BSP). To use the GNU cross compiler provided with Tornado, you must have purchased the appropriate BSP for your Freeway. The pc486 BSP is required for Freeway 1100/1150/1200/1300, the mv162 BSP is required for a Freeway 2000/4000/8800 with an MVME 162 CPU, and the mv2604 BSP is required for a Freeway 2000/4000/8800 with an MVME 2600 CPU.

If you are using a GNU compiler that is not part of a Tornado distribution, you must make several modifications to the environment files and make files used to build your SRA. See the *Freeway Server Software Toolkit Programmer's Guide* for further information on building the SRA without the Tornado distribution.

Compile the example SRA code using the provided make files.

Step 1: Edit **freeway\envcom**

Modify the path assigned to FWBASE in the freeway\envcom file to match your Freeway installation directory.

Step 2: Build the SRA object module

To build the SRA object module, you must compile and link the example SRA source code by running one of the make files provide in the freeway directory. The make file will place the resulting SRA object module in the freeway\boot directory. The name of the object module generated is sra486.o for Freeway 1100/1150/1200/1300, sra68K.o for a Freeway 2000/4000/8800 with an MVME 162 CPU, or srappc.o for a Freeway 2000/4000/8800 with an MVME 2600 CPU.

If you are using the GNU tool set distributed with Tornado to compile your SRA, you must create a custom build project using the Tornado development environment. Start by launching the Tornado development environment, then from the menu bar select Project, Customize..., then Add.... Enter one of the following for the name of the build target:

For Freeway 1100/1150/1200/1300:

-f MakeSRA.I486 clean all

For a Freeway 2000/4000/8800 with an MVME 162 CPU:

-f MakeSRA.68K clean all

For a Freeway 2000/4000/8800 with an MVME 2600 CPU:

-f MakeSRA.ppc clean all

Enter the path of your Freeway installation directory (for example, C:\freeway) for the working directory of the customized build just created.

When you are finished creating the custom project, perform the build by selecting Project from the Tornado menu bar, then selecting the name of the build target you've created. Tornado will make the SRA object module and place it in the freeway\boot directory.

Remember to modify the boot configuration file as indicated in Section 2.2.3 on page 45 to tell Freeway to load and run the example SRA at boot time and to use muxcfg.sra as the transport subsystem interface (TSI) configuration file.

Because the example SRA runs the loopback test automatically when Freeway is booted, install a three-headed loopback cable between links 0 and 1 of ICP 0 and a synchronous modem before continuing to Section 2.5 on page 93.

2.4.7 Compile the Server Toolkit

To build a customized Freeway image using the optional Server Toolkit product, you must have purchased and installed Tornado from Wind River Systems with the appropriate Board Support Package (BSP) for your Freeway. The pc486 BSP is required for Freeway 1100/1150/1200/1300, the mv162 BSP is required for a Freeway 2000/4000/8800 with an MVME 162 CPU, and the mv2604 BSP is required for a Freeway 2000/4000/8800 with an MVME 2600 CPU. Your Tornado installation must match the version of Tornado used by Protogate to build the Freeway server product. See the Server Toolkit release notes for the current version of Tornado required for building the Toolkit.

Caution

When building the Server Toolkit, the Freeway and VxWorks images in the freeway\boot directory are overwritten. Before executing the make instructions for the Server Toolkit, be sure to archive the original copies of these files that were delivered with the Freeway and Server Toolkit distributions so they can be easily restored.

Compile the Server Toolkit using the provided make files.

Step 1: Edit freeway\envcom. Modify the path assigned to FWBASE in the freeway\envcom file to match your Freeway installation directory.

Step 2: To use the GNU tool set distributed with Tornado to compile the Server Toolkit, you must create a custom build project using the Tornado development environment. Start by launching the Tornado development environment, then from the menu bar select Project, Customize…, then Add…. Enter one of the following for the name of the build target:

For Freeway 1100/1150/1200/1300:

-f MakeSTK.I486 clean all

For a Freeway 2000/4000/8800 with an MVME 162 CPU:

-f MakeSTK.68K clean all

For a Freeway 2000/4000/8800 with an MVME 2600 CPU:

-f MakeSTK.ppc clean all

Enter the path of your Freeway installation directory (for example, C:\freeway) for the working directory of the customized build just created.

Step 3: When you are finished creating the custom project, perform the build by selecting Project from the Tornado menu bar, then selecting the name of the build target you've created.

Tornado will build the Freeway server image, VxWorks image, and loadable Freeway server module for the specified Freeway architecture and place them in the freeway\boot directory.

2.4.8 Build the Loopback Tests

For all protocols and toolkits except the example server-resident application, you must build the loopback tests supplied with the Freeway software. A make file is included that performs this operation.

Step 1: Edit the client TSI configuration files in **freeway\client\test*ppp***

For all protocols and toolkits except the example server-resident application, edit each of the client transport subsystem interface (TSI) configuration files listed in Table 2–7, changing the default value of the Freeway server parameter, freeway_0, to the name (or Internet address) of your current Freeway server.

A client TSI configuration file might reference the server parameter more than once, and must be changed at each occurrence.

Note

If the server name and Internet address have not already been added to the hosts file during hardware installation, refer to your system manual for the location of the hosts file and add the appropriate information.

Note

There is a separate *server* TSI configuration file, usually called muxcfg, which does not require modification for most sites.

Table 2–7: Client TSI Configuration Files (Windows NT)

AUTODIN	AWS	BSC3270	BSC2780/3780
autodinaltcfg	awsaltcfg	bsc3270altcfg	bsc3780altcfg
DDCMP	FMP	ADCCP NRM	Protocol Toolkit
ddcmpaltcfg	fmpaltcfg	nrmaltcfg	spsaltcfg
STD1200B	Military/Government Protocol	X.25/HDLC	
s12altcfg	miltcfg	apitcfg	

Step 2: Edit the DLI configuration files (Freeway 1100/1150/1200/1300) in **freeway\client\test*ppp***

If you are installing a protocol on Freeway 2000/4000/8800, skip to Step 3.

If you are installing DDCMP, protocol toolkit, or X.25 on Freeway 1100/1150/1200/1300, skip to Step 3. The electrical interface for DDCMP and protocol toolkit is

specified when you run the loopback test. The electrical interface for X.25 is specified in the .setup file in the freeway\client\test\x25mgr directory.

If you are installing AWS, BSC, or FMP on Freeway 1100/1150/1200/1300, change to the freeway\client\test*ppp* directory. Specify the electrical interface by editing the data link interface (DLI) configuration files listed in Table 2–8.

Open each file and locate each occurrence of ElecInterface. Remove the double slashes (//) from the beginning of each ElecInterface line. If you will not be using the default EIA-232 electrical interface, replace EIA232 with one of the following:

- EIA449
- EIA530
- V35

Table 2–8: Client DLI Configuration Files (Windows NT)

AWS	BSC3270	BSC2780/3780	FMP
awsaldcfg	bsc3270aldcfg	bsc3780aldcfg	fmpaldcfg

Step 3: Run the make file

From the freeway\client\test*ppp* directory, enter one of the following commands depending on the system you are using. The newly created files will be placed in the proper freeway\client*op-sys*\bin directory.

nmake -f makefile.ant all (for an Alpha NT system)
nmake -f makefile.int all (for an Intel NT system)

Go to Section 2.5 on page 93 for the next step in the installation procedure. For a description of the Freeway files you have just installed onto your boot server, refer to Appendix B.

2.5 Modify the Freeway System Boot Parameters

In the Freeway System Boot Parameters menu, modify the path name for the System Boot Directory. See Section 4.5.1 on page 148 for details on how to modify the boot parameters.

During the UNIX default installation, example boot configuration and load files were installed in the /usr/local/freeway/boot directory.

During the VMS default installation, example boot configuration and load files were installed in the SYS$SYSDEVICE:[FREEWAY.BOOT] directory.

During the Windows NT default installation, example boot and load configuration files were installed in the C:\freeway\boot directory. If you are using Windows NT version 4.0 or later, use the alias you have set up to point to the C:\freeway\boot directory.

2.6 Boot Freeway

It is assumed that you have configured the Freeway boot parameters as described in the appropriate Freeway hardware installation guide. Return to the local console next to the Freeway unit and select option 1 at the Freeway Boot System Main Menu (shown in Figure 2–5) to start the boot process. See Section 4.3.1 on page 122 for boot process details.

Note

The Freeway 1100/1150/1200/1300 server can be booted the first time using a local console or by using the boot parameters initialization disk. The Freeway 2000/4000/8800 must be booted the first time from a local console to activate the Interactive Menu. After the initial system boot, you can telnet or rlogin to Freeway from the boot server (or from any other computer on the network) and use the Freeway Interactive Menu for any of the Freeway operations described in the Chapter 4.

```
VI-100-0345: FWBOT 2.8-5 Jan 29 1999 Freeway Boot System
Main Menu
---------

1)    System Boot

2)    Display Boot Parameters

3)    Edit Boot Parameters

Select:
```

Figure 2–5: Sample Freeway Boot System Main Menu

Caution

With the example server-resident application (SRA) software specified in the boot configuration file, the loopback test runs automatically when Freeway is booted. A three-headed loopback cable must be installed between links 0 and 1 of ICP 0 and a synchronous modem before booting Freeway. The loopback test opens the DLI sessions and enables the two links, then transfers data on both links. The test continues for 60 seconds, then the number of messages sent and received on each link are printed on the Freeway console. (Other Freeway log messages can appear before, after, or intermingled with these statistics.) Links are then disabled and the sessions are closed. Press return until you see the Login prompt.

After a successful system boot, the following login prompt appears at the Freeway local console:

```
Freeway User Login:
```

At this point you can log in to Freeway from the local console with the default Freeway user name (**simpact**) and password (**password**):

```
Freeway User Login: simpact
Password: password
```

You can also rlogin (or telnet) to Freeway from the boot server or any other computer on the network; for example:

rlogin freeway1	**telnet freeway1**
Freeway User Login: **simpact**	Freeway User Login: **simpact**
Password: **password**	Password: **password**

The password is not actually displayed on the screen.

The Freeway Interactive Menu is then displayed. Chapter 4 describes the Interactive Menu in detail. You can change the Freeway user name and password as described in Section 4.5.2 on page 154.

Freeway software installation is now complete. The next section describes additional procedures.

2.7 The Next Steps

After you have successfully performed the software installation procedures described in this chapter, proceed as follows:

- For all protocols except the example server-resident application, run the loopback test using the same computer you configured as the boot server and used for the Freeway software installation. Refer to the document *Freeway Loopback Test Procedures (DC 900-1533)*. The loopback test for the example SRA runs automatically when Freeway is booted.
- Read Chapter 3 to determine whether you need to customize your system configuration. If you have installed more than one protocol, you can customize your installation and run the loopback tests for the additional protocols. Customization is not necessary at most sites.
- You can use the Freeway local console to display or customize server parameters or perform server operations. Alternatively, you can access the Freeway Interactive Menu using telnet or rlogin from the boot server or any other computer on the network.
- Familiarize yourself with Freeway operations as described in Chapter 4.
- Connect the WAN cables. Your Freeway server is ready to communicate with its client computers.

Chapter

3 Customize the System Configuration

Freeway system configuration information is contained in a boot configuration file and a server transport subsystem interface (TSI) configuration file. Default versions of these files are shipped with your Freeway software and are sufficient for most sites. If you need to customize the system information in these files, follow the procedures described in this chapter.

The boot configuration file (freeway/boot/bootcfg.*xxx*, explained further in Section 3.2) defines the following:

- Physical devices within the Freeway server, such as the ICPs. Freeway uses this information to configure devices during the boot process.
- Virtual devices within the Freeway server, such as the ICP_IPs. Freeway uses this information to define the characteristics of IP data streams.
- Services (such as the FMP or X.25 services) that run on the physical or virtual devices. Freeway uses this information to download the appropriate software to these devices during the boot process.
- Server-wide parameters to be used by the Freeway system service provider to configure Freeway at startup.

The server TSI configuration file (freeway/boot/muxcfg) defines the parameters that allow the server TSI software to communicate with the client TSI software. It is explained further in Section 3.3 and Section 3.4.

3.1 Determine If You Need to Customize System Configuration

Most sites, especially sites using the default installation and only one protocol, only need to edit the bootcfg.*xxx* file to specify the protocol for each ICP. You might, however, decide to further customize the files for any of the following reasons:

- If you installed more than one protocol (for example, FMP and X.25), you must edit the boot configuration file (freeway/boot/bootcfg.*xxx*[1]) to indicate which ICP will be downloaded with which protocol. See Section 3.2.
- If you want to specify error message logging or message tracing, you might want to modify the server TSI configuration file (freeway/boot/muxcfg[2]). Be very careful if you modify parameters in the server TSI configuration file that control server resources, such as the TSI buffer pool size or message size, because improper values could adversely affect server operation. See Section 3.3 and Section 3.4.
- If you want to use more than one local area network interface (for example, dual Ethernet or both Ethernet and FDDI), you must edit the boot configuration file (freeway/boot/bootcfg.*xxx*[1]) to indicate which added interface type is to be used, the Internet protocol (IP) address to assign to that interface, and the subnet mask to set for the interface. See Section 3.2.
- If you want to establish a gateway to a destination network or specify a default gateway, you can do this in the boot configuration file (freeway/boot/ bootcfg.*xxx*[1]). See Section 3.2.

1. Freeway 1100 uses bootcfg.isa (ICP2424) or bootcfg.pci (ICP2432). Freeway 1150/1200/1300 uses bootcfg.pci. Freeway 2000/4000/8800 uses bootcfg.vme. Any Freeway using ICP_IP virtual ICP devices may use bootcfg.ip.

2. The example server-resident application uses muxcfg.sra. The Military/Government protocol uses milmuxcfg.

- If you want to load a server-resident application (SRA) and/or spawn an SRA task to run on Freeway, you can indicate the name of the application object module and the function name of the application's entry point in the boot configuration file (freeway/boot/bootcfg.*xxx*[1]) See Section 3.2.

- You might need to decrease either the buffer size or number of buffers in the server TSI configuration file (freeway/boot/muxcfg[2]) to eliminate memory allocation errors when Freeway boots. See Section 3.3 and Section 3.4.

  For example, if you get an error similar to the following when you boot Freeway, you might edit the existing freeway/boot/muxcfg file to set maxbuffers = 256. (The value you require for maxbuffers might be different.)

  ```
  0x38ddf8 (msg_mux): memPartAlloc: block too big -
  1318912 in partition 0x1d3708.
  0x38ddf8 (msg_mux): ERROR: tInit: tserrno = -10
  ```

- If you are using ICP_IP virtual devices, you must modify the boot configuration file as described in Section 3.2.1.

1. Freeway 1100 uses bootcfg.isa (ICP2424) or bootcfg.pci (ICP2432). Freeway 1150/1200/1300 uses bootcfg.pci. Freeway 2000/4000/8800 uses bootcfg.vme. Any Freeway using ICP_IP virtual ICP devices may use bootcfg.ip.

2. The example server-resident application uses muxcfg.sra. The Military/Government protocol uses milmuxcfg.

3.2 Customize the Default Boot Configuration File

When you followed the software installation procedures in Chapter 2, the default boot configuration files were installed in the freeway/boot directory on the boot server. The boot configuration files are:

- bootcfg.ip for any Freeway with ICP_IPs (virtual ICP devices)
- bootcfg.isa for a Freeway 1100 with ICP2424s (ISAbus boards)
- bootcfg.pci for a Freeway 1100/1150/1200/1300 with ICP2432s (PCI boards)
- bootcfg.vme for Freeway 2000/4000/8800s

Note

On UNIX systems, all default directories are installed under the /usr/local/freeway directory. On VMS systems, all default directories are installed under the directory named SYS$SYSDEVICE: [FREEWAY]. For Windows NT versions earlier than 4.0, the default directory is C:\freeway. For Windows NT 4.0 or later, use the alias you have set up to point to the freeway directory.

During the boot process, Freeway uses the boot configuration file to configure physical and virtual devices, services, and corresponding databases prior to downloading the software to the ICPs. See Section 4.3.1 on page 122 for a complete description of the boot process.

Figure 3–1 shows a sample boot configuration file that configures two ICPs in a Freeway server. This file enables Freeway to download X.25 software to an ICP with device name icp0 and download FMP software to an ICP with device name icp1. (The introductory comments from the beginning of the file have been omitted.)

```
#----------------------------------#
# ICP0 Physical Parameters       #
#----------------------------------#
#
device_name        = icp0
device_type        = icp2432
slave_address      = 0x14
bus_number         = 0
download_script    = fmpload

#----------------------------------#
# ICP1 Example Physical Parameters #
#----------------------------------#
#
device_name        = icp1
device_type        = icp2432
slave_address      = 0x13
bus_number         = 0
download_script    = fmpload

#----------------------------------#
# ICP2 Example Physical Parameters #
#----------------------------------#
#
#device_name        = icp2
#device_type        = icp2432
#slave_address      = 0x12
#bus_number         = 0
#download_script    = fmpload

#----------------------------------#
# ICP3 Example Physical Parameters #
#----------------------------------#
#
#device_name        = icp3
#device_type        = icp2432
#slave_address      = 0x11
#bus_number         = 0
#download_script    = fmpload
```

Figure 3–1: Freeway 1100/1150/1200/1300 Boot Configuration File (bootcfg.pci)

```
#---------------------------#
# Server wide parameters    #
#---------------------------#

tsi_config_file      =  muxcfg
#route_add           =  0 192.192.192.192

#sra_module           = sra486.o
#sra_entry           = sraInit

vxworks_shell        = FALSE

#added_interface_type =  elt,2
#added_interface_mask =  ffffff00
#added_interface_addr =  207.207.207.207
```

Figure 3–1: Freeway 1100/1150/1200/1300 Boot Configuration File (bootcfg.pci) *(Cont'd)*

The boot configuration file allows comment lines to be entered by placing the pound sign (#) at the beginning of a line of text. All blank lines are skipped. All fields must be delimited with white space. White space between each field can be spaces or tabs.

Following is a description of the parameters in the boot configuration file:

Device Name The device_name parameters in the example file in Figure 3–1 are icp0 and icp1. Freeway uses the device names to identify the devices. If a Freeway client uses the data link interface (DLI), the device name must be of the form "icp*x*", where *x* corresponds to the BoardNo parameter in the DLI configuration file, freeway/client/test/*ppp*/*ppp*aldcfg[1]. Each device name entered in the boot configuration file must be unique. (Remember that the *ppp* variable specifies the particular protocol or toolkit you are using. Refer to Table 2–2 on page 31.)

1. The DLI configuration file for X.25 is freeway/client/test/x25mgr/apidcfg.

Device Type The device_type parameter for both ICPs in the example file is ICP2432. This indicates that the device type is an intelligent communications processor that can be downloaded with software. All ICP devices installed in a Freeway 1100/1150/1200/1300 server must be of type ICP2424, ICP2432, or ICP_IP, while those installed in a Freeway 2000/4000/8800 server must be of type ICP6000 or ICP_IP. To avoid confusion with the configuration parameters for physical ICP boards, configuration parameters specific to ICP_IP virtual devices are described separately in Section 3.2.1.

Slave Address On a Freeway 1100, the slave_address parameter for an ICP2424 (ISA-bus board) identifies the dip switch setting (in hex) on the ICP (for example, 4 or 5). Refer to the *ICP2424 Hardware Description and Theory of Operation* manual for information on how to configure ICPs on the ISAbus.

On a Freeway 1100/1150/1200/1300, the slave_address parameter for an ICP2432 (PCI board), along with the bus_number parameter, identifies the physical slot in which the board resides. See the freeway/boot/bootcfg.pci file for the slot-to-slave address/bus number mapping.

On a Freeway 2000/4000/8800, the slave_address parameter identifies the slave address that was configured for the specific ICP on the VME bus. Refer to the *Freeway ICP6000R/ICP6000X Hardware Description* manual for information on how to configure ICPs on the VMEbus. Note that the slave address depends on the type of CPU used in your Freeway. Appropriate slave addresses for each configuration are indicated in the freeway/boot/bootcfg.vme file.

Bus Number On a Freeway 1100/1150/1200/1300, the bus_number parameter for an ICP2432 (PCI board), along with the slave_address parameter, identifies the physical slot in which the board resides. See the freeway/boot/bootcfg.pci file for the slot-to-slave address/bus number mapping. The bus_number parameter is only used for ICP2432 boards.

Download Script If the service provider owns a device that is downloadable, Freeway executes a load program on behalf of the service provider before starting the service provider image. The download_script parameter should define the name of a download script file that can be used by the download utility. If no path name is provided, Freeway searches the System Boot Directory specified in the System Boot Parameters menu (described in Section 4.5.1 on page 153) for the file name indicated. Use a fully qualified path name to the download script file if the file is placed in another directory.

Server TSI Configuration File At boot time, Freeway uses the server TSI configuration file to configure the interface between the server software and the transport subsystem. This file name is specified in the tsi_config_file parameter. The default is freeway/boot/muxcfg[1] (Section 3.3.2).

Route Add An optional "route add" parameter can be specified. This field adds a gateway to the Freeway server's routing tables. Freeway does not have a routing daemon, and must be explicitly informed about a gateway. The first parameter indicates the Internet address of a destination network or machine, and the second parameter indicates the Internet address of a gateway to that network or machine. For example:

```
route_add    126.0.0.0    207.67.135.10
```

tells Freeway that the machine with Internet address 207.67.135.10 is the gateway to network 126.0.0.0. To specify a default gateway, the first parameter should be set to "0" and the second parameter should indicate the Internet address of the host to be the default gateway. This parameter may be used multiple times to add gateways for multiple destinations. The Internet address of the default gateway must be the same as the address entered for the Gateway Inet Interface parameter of the System Boot Parameters menu described in Section 4.5.1 on page 153.

1. The example server-resident application uses muxcfg.sra. The Military/Government protocol uses milmuxcfg.

SRA Module The optional sra_module parameter indicates the name of an object module to be downloaded at boot time by the Freeway service provider. If no path name is provided, Freeway searches the System Boot Directory specified in the System Boot Parameters menu (described in Section 4.5.1 on page 153) for the object module name indicated. A fully qualified path name to the object module may be used if the module is placed in another directory.

To load the example SRA module delivered with the Freeway, the sra_module parameter should be set to sra*xxx*.o[1]. Multiple modules may be loaded by repeating the sra_module parameter. The only limit to the number of modules that may be loaded is the amount of memory on the server. Before any modules are loaded, the symbol table for the Freeway server (fw*yyy*.sym[2]) is loaded from the System Boot Directory to resolve all function references called from within the loaded modules. All modules indicated with the sra_module parameter will be loaded before the Freeway service provider executes the download scripts indicated with the download_script parameters.

SRA Entry The optional sra_entry parameter may be used to indicate the name of a function to be spawned as a task by the Freeway service provider. Multiple tasks may be spawned by repeating the sra_entry parameter. All of the tasks resulting from this parameter are spawned after the Freeway service provider has completed executing all of the download scripts indicated with download_script parameters. The only limit to the number of tasks that may be spawned using sra_entry parameters is the amount of memory on the server. To run the example SRA delivered with Freeway, the sra_entry parameter should be set to sraInit. For more information about the example SRA, refer to the *Freeway Server-Resident Application and Server Toolkit Programmer Guide*.

---

1. *xxx* = 486 for Freeway 1100/1150/1200/1300, 68K for a Freeway 2000/4000/8800 with an MVME 162 CPU, or ppc for a Freeway 2000/4000/8800 with an MVME 2600 CPU.

2. *yyy* = 486 for Freeway 1100/1150/1200/1300, 162 for a Freeway 2000/4000/8800 with an MVME 162 CPU, or 2604 for a Freeway 2000/4000/8800 with an MVME 2600 CPU.

VxWorks Shell The vxworks_shell parameter indicates whether or not access to the VxWorks operating system through a command shell is desired. If this parameter is set to TRUE, an option will appear in the main menu of the Freeway Interactive Menus providing access to the shell. The VxWorks shell allows you to interactively invoke any subroutine that has been loaded into Freeway's memory, including those supplied by the VxWorks operating system, those supplied by Protogate, and those defined in any of your own application modules that have been loaded using the sra_module parameter or via the shell.

Upon the first invocation of the shell, the symbol table for the Freeway server (fw*yyy*.sym[1]) is loaded from the System Boot Directory to resolve all function references called from the shell, unless it has already been loaded to resolve references in modules loaded with the sra_module parameter. Because use of the VxWorks shell requires at least a working knowledge of the VxWorks operating system and provides a powerful interface which could cause Freeway to crash if used improperly, it is recommended that this parameter be set to FALSE after development of your customized application modules is complete.

Added Interface Type This optional parameter identifies LAN interfaces to be used by Freeway in addition to the primary network interface. The primary network interface is defined in the System Boot Parameters menu (described in Section 4.5.1 on page 153), either with the Boot Device parameter if booting from the network or with the Secondary Network Interface if booting from disk. The types of interfaces supported for the added_interface_type parameter, and the value to be used to specify each, are as defined for the Boot Device parameter on page 150.

1. *yyy* = 486 for Freeway 1100/1150/1200/1300, 162 for a Freeway 2000/4000/8800 with an MVME 162 CPU, or 2604 for a Freeway 2000/4000/8800 with an MVME 2600 CPU.

If you are using dual Ethernet or dual fast Ethernet with the elt, fei, or dc type of interface, and you anticipate switching between the primary and secondary Ethernet interface for your boot device while still connecting to the other interface, you may enter just elt,[1, 2, or 3], fei, or dc for the added_interface_type parameter. Freeway will interpret this as an instruction to attach to the first unused interface of the elt, fei, or dc type.

So, if you booted from the primary fei device, for instance, and enter fei for the added_interface_type, the secondary interface will be attached as the added interface. Likewise, if you booted from the secondary fei device by entering fei1 for the boot device and left fei as the added_interface_type, the primary fei device would be attached as the added interface.

This eliminates the need to modify the boot configuration file every time you switch between the primary or secondary interface as the boot device. Note that you may also explicitly indicate the primary interface by entering elt0,[1, 2, or 3], fei0 or dc0 if desired for clarity.

The added_interface_type parameter may be repeated along with the added_interface_mask and added_interface_addr parameters to indicate multiple added interfaces.

Added Interface Mask For each added_interface_type parameter, the optional added_interface_mask parameter may be used to specify the subnet mask to be set for the interface. The parameter must be provided in hexadecimal format. If this parameter is omitted for an added interface, the subnet mask specified in the FREEWAY Subnet Mask parameter of the System Boot Parameters menu (described in Section 4.5.1 on page 153) is used for that interface.

Added Interface Address The added_interface_addr parameter must be supplied with each added_interface_type to indicate the Internet address in decimal format to be assigned to the added interface.

3.2.1 Configuration Parameters for ICP_IP Virtual Devices

ICP_IP virtual devices behave just like physical ICP boards except that they send and receive data via an IP network rather than via a serial line. This section describes the parameters in the boot configuration file used for ICP_IP devices. These parameters specify the configuration of the IP link implemented by an ICP_IP device (for example, the IP addresses and ports, data format, and so on). Each ICP_IP device may be configured independently of all other ICP_IP devices.

The bootcfg.ip file contains examples of the ICP_IP parameters. This file is preconfigured with the following devices:

icp0	Commented-out examples of an ICP2424, ICP2432, and ICP6000
icp1	ICP_IP stream listening socket (TCP/IP server)
icp2	ICP_IP stream connecting socket (TCP/IP client)
icp3	ICP_IP datagram socket (unicast)
icp4	ICP_IP datagram socket (multicast)

Edit the freeway/boot/bootcfg.ip file, modifying the following fields as necessary to set up each ICP_IP virtual device:

Device Name The device_name parameters in the example file in the bootcfg.ip file are icp0 through icp3. Freeway uses the device names to identify the devices. If a Freeway client uses the data link interface (DLI), the device name must be of the form "icp*x*", where *x* corresponds to the BoardNo parameter in the DLI configuration file, freeway/client/test/*ppp*/*ppp*aldcfg[1]. Each device name entered in the boot configuration file must be unique. (Remember that the *ppp* variable specifies the particular protocol or toolkit you are using. Refer to Table 2–2 on page 31.)

Device Type The device_type parameter for ICP_IP virtual devices must be icp_ip.

1. The DLI configuration file for X.25 freeway/client/test/x25mgr/apidcfg.

Socket Type The socket_type parameter must be sock_dgram, sock_stream_listen, or sock_stream_connect. (The sock_stream parameter string can be used in place of sock_stream_connect.) The sock_dgram parameter specifies a UDP/IP packet data stream. The sock_stream_listen parameter specifies a TCP/IP server (listening) socket and the sock_stream_connect parameter specifies a TCP/IP client (connecting) socket.

Local Address The local_address parameter specifies the IP address at which Freeway receives packets. This field may be left blank or set to 0.0.0.0, in which case any configured IP address of Freeway will be used. For devices that will receive multicast packets, this field must be set to the multicast IP address. (Receiving multicast packets requires a special version of Freeway.)

Local Port Base The local_port_base parameter specifies the port number on which Freeway will receive packets when "link 0" is selected. This number must be specified in hex format. The link number is added to local_port_base whenever a "link" is opened, so that a dlOpen on link 7 will open a socket using port local_port_base + 7. If the local_address is set to 0.0.0.0 and the local_port_base is set to 0, Freeway will use any available port, with any configured IP address.

Local Interface Address The local_if_address parameter specifies the IP address of the interface on which Freeway will receive packets. This field is only required for devices which will receive multicast packets on another interface than the default boot IP address. (Receiving multicast packets requires a special version of Freeway.)

Foreign Address The foreign_address parameter specifies the IP address to which Freeway will send packets.

Foreign Port Base The foreign_port_base parameter specifies the IP port number to which Freeway will send packets when "link 0" is selected. This number must be specified in hex format.

Time to Live The ttl parameter specifies the time-to-live of outgoing data packets.

Receive Buffer Size The rcv_buf_size parameter specifies the size of the IP receive buffer in bytes.

Send Buffer Size The snd_buf_size parameter specifies the size of the IP send buffer in bytes.

Send Queue Size The snd_q_size parameter specifies the number of packets to be queued on a TCP/IP connection if the other side of the connection stops reading. The default is 48 packets.

Connect Period The connect_period parameter specifies the number of seconds to wait between attempts to connect. (This field applies only to socket_type == sock_stream_connect.)

Linger Off The linger_off parameter sets the "linger" socket parameter off. This is the default. (This field applies only to socket_type == sock_stream_listen or socket_type == sock_stream_connect.)

Linger On The linger_on parameter sets the "linger" socket parameter on, and the linger duration to a specified number of seconds. (This field applies only to socket_type == sock_stream_listen or socket_type == sock_stream_connect.)

Internal Protocol The internal_protocol parameter specifies the protocol name to be used. This name corresponds to the name of a code module which implements a communications protocol using data sent and received on the IP link. These code modules may be built in (ipapi, which is included in all Freeways) or purchased separately from Protogate and loaded with the sra_module command in the server-wide parameters at the end of the boot configuration file. For example, if the sra_module command is used to load ipfmp486.o, the internal_protocol parameter may be set to ipfmp.

3.3 Server TSI Configuration

While building the loopback test program, you modified the *client* TSI configuration file (freeway/client/test/*ppp*/*ppp*altcfg). There is also a *server* TSI configuration file (freeway/boot/muxcfg[1]) for the server TSI software running on Freeway. This section gives an overview of TSI configuration and describes the muxcfg file. See the *Freeway Transport Subsystem Interface Reference Guide* for complete details regarding TSI configuration.

3.3.1 TSI Configuration Overview

The information exchange between the server software and the TSI is managed by a TSI *connection*. The TSI connection manages the I/O with the client using the server's socket library and other I/O support functions such as the VxWorks signal facility. One TSI connection can be used by multiple server sessions.

TSI connections are defined in a server TSI configuration file (such as muxcfg). Two types of configuration sections are included in the TSI configuration file. The first section (called "main") specifies the TSI configuration for non-connection-specific operations. Subsequent sections define the operational environment for one or more specific connections.

Note

If you define multiple TSI connections, each should have a unique connection name; otherwise the parameters associated with the first occurrence are used for all sessions with the same name.

1. The example server-resident application uses muxcfg.sra. The Military/Government protocol uses milmuxcfg.

All sections of the TSI configuration file have the following format:

```
connection-name
{
        parameter-name = parameter-value; // comments...
                        .
                        .
                        .
}
```

3.3.2 Default Server TSI Configuration File (muxcfg)

When you followed the software installation procedures described in Chapter 2, the default server TSI configuration file named muxcfg[1] (Figure 3–2) was installed in the freeway/boot directory on the boot server. Freeway uses the information in the muxcfg file to set up the server-resident TSI software to listen for incoming client connections on the default well-known port. For most sites, muxcfg can be used "as is."

During the boot process (described in Section 4.3.1 on page 122), Freeway uses the information in the boot configuration file (Figure 3–1 on page 101) to configure physical or virtual devices, services, and corresponding databases prior to downloading software to the ICPs. One of the parameters in the boot configuration file is the server TSI configuration file name (tsi_config_file = muxcfg). Freeway downloads the muxcfg file and uses it to configure the server-resident TSI software so it can communicate (using the Freeway message multiplexor) with the client TSI software. Refer back to Figure 1–1 on page 24 to see how the server TSI software relates to the Freeway message multiplexor.

There is one critical difference between the server TSI software and the client TSI software, namely that the server TSI software *must* use TSI non-blocking I/O support (that is, the AsyncIO parameter in the muxcfg file must be set to "yes", as shown in Figure 3–2).

1. The example server-resident application uses muxcfg.sra. The Military/Government protocol uses milmuxcfg.

```
//
// source control identifier
// @(#)$Id: muxcfg,v 1.6 1998/06/15 21:57:25 jcolston Exp $
//
//-------------------------------------------------------------------------//
//
// This file is for the server resident TSI configuration processor.
// It is used by the TSI interface for msgmux (message multiplexor)
//
//                    Date        Initials    Abstracts
//                    27Jan94     KietD       Original coding...
//                    15Jun98     JColston    PR1172 - maxbuffers back to 512
//
//-------------------------------------------------------------------------//
main
{
                    logLev = 0;
                    traceLev= 3;
                    maxbuffers = 512;                          /* PR1172 */
                    tracename = "/ram1/msgmux.trc";
                    tracesize = 64000;
                    asyncio = "yes";
                    maxbufsize = 1200;
                    stacksize = 10240;
                    maxconns = 128;
}
//
Server1
{
                    transport = "tcp-socket";
                    logLev = 0;
                    traceLev = 3;
                    timeout = 63999;
                    MaxInQ = 10;
                    MaxOutQ = 10;
                    asyncio = "yes";
                    wellknownport = 0x'2010'; // protocol specifics
}
```

Figure 3–2: TSI Configuration File (muxcfg) for Server-Resident Software

```
//
Server2
{
                    transport = "tcp-socket";
                    logLev = 0;
                    traceLev = 3;
                    timeout = 63999;
                    MaxInQ = 10;
                    MaxOutQ = 10;
                    asyncio = "yes";
                    wellknownport = 0x'2011'; // protocol specifics
}
```

Figure 3–2: TSI Configuration File (muxcfg) for Server-Resident Software *(Cont'd)*

Changing the AsyncIO parameter to "no" or omitting it prevents the server TSI software from operating as designed.

Caution

Before modifying the muxcfg file for the server TSI software, you should be familiar with the parameter descriptions in the *Freeway Transport Subsystem Interface Reference Guide*. Of particular importance are those parameters that control server resources, such as the TSI buffer pool size (MaxBuffers parameter) or message size (MaxBufSize parameter). Improper values could adversely affect server operation.

Keep the following points in mind if you must modify the muxcfg file:

- The Transport parameter for each connection name has no default and must be defined.
- Unlike the client TSI configuration file you modified (described in Section 2.2.8 on page 53 for UNIX, Section 2.3.7 on page 71 for VMS, or Section 2.4.8 on page 90 for Windows NT), the server parameter is not required for muxcfg because the server TSI software automatically uses the address of the machine on which it is running.

- The parameters can appear in any order in the configuration file and can be upper-case, lower-case, or a mixture.
- If a parameter is not explicitly contained in the file, the default is used (defaults are shown in Figure 3–2 on page 113).

3.4 Customize the Default Server TSI Configuration File

Use the following procedure to customize the default server TSI configuration file (freeway/boot/muxcfg[1]):

Step 1: You can use any ASCII text editor to edit the muxcfg file. If a default parameter value is desired, you can omit the parameter line from the file. Parameters in the "main" section apply to non-connection-specific operations. Parameters in the "connection-dependent" section apply to a single connection only.

Step 2: If you change the name of the muxcfg file, you must modify the tsi_config_file parameter in the boot configuration file. See Section 3.2 on page 100 for a description of the default boot configuration file.

Step 3: Reboot Freeway. You can use the Freeway Boot System Main Menu from the local console or the Freeway Interactive Menu from the local console or any computer on the network.

1. The example server-resident application uses muxcfg.sra. The Military/Government protocol uses milmuxcfg.

Chapter

4 Operations

The Freeway server provides many facilities to manage its operation, such as:

- Server management service provider (SMSP)
- Simple network management protocol (SNMP) task
- Interactive server management services

The SMSP task starts the Freeway services at boot time. The SNMP task is an SNMP v1/v2c-compliant SNMP agent.

The user interacts with Freeway using a menu-driven interface (the Freeway Interactive Menu) available through a local console port or by using telnet or rlogin across the network. A series of menus provide access to statistics, error reports, configuration, and control of server operation. The Freeway hardware installation guides describe how to connect the local console.

This chapter first describes the startup and shutdown procedures, then describes the choices available on the Freeway Interactive Menu.

4.1 Startup and Shutdown Procedures

The following sections describe the typical sequence of steps used to startup and shutdown Freeway. Because startup and shutdown requirements might vary, you should check with your system administrator to establish the best procedures for your site. Note that Freeway is designed for continuous operation. Most sites leave the unit online twenty-four hours a day, seven days a week, shutting down only to perform maintenance or install upgrades.

4.1.1 Startup Procedures

This procedure assumes that you have already installed Freeway and it is fully operational on your network. Whenever you power up or reboot the system, Freeway first executes system diagnostics. If the diagnostics are successful, the boot process is performed automatically as specified by the Flags boot parameter on page 151.

If the system boot succeeds, the following login prompt appears at the Freeway local console (if one is currently connected):

```
Freeway User Login:
```

At this point you can log in to Freeway from the local console with the Freeway user name (default is **simpact**) and password (default is **password**):

```
Freeway User Login: simpact
Password: password
```

Caution

The Freeway user name and password are used to access the Freeway Interactive Menu. They are not to be confused with the FTP user name and FTP password (which have defaults of **freeway** and **password**). The latter are Freeway system boot parameters which are used between Freeway and the boot server during system boot (see Section 4.5.1 on page 148).

You can also use rlogin (or telnet) to log in to Freeway from the boot server or any other computer on the network; for example:

rlogin freeway1	**telnet freeway1**
Freeway User Login: **simpact**	Freeway User Login: **simpact**
Password: **password**	Password: **password**

The password is not actually displayed on the screen.

When you first install Freeway, the default user name (**simpact**) and password (**password**) are in effect. Use the Modify User Names menu described in Section 4.5.2 on page 154 to change the user names and passwords. The User/Password table is permanent and is checked each time Freeway is rebooted. If all user names are removed or the table becomes corrupted, the User/Password table will automatically be rebuilt the next time Freeway is rebooted and the default user name and password will again be in effect.

After you log in, the Freeway Interactive Menu is displayed (Section 4.2 on page 120) and client processes can begin accessing Freeway.

4.1.2 Shutdown Procedures

1. Inform all network users that you will be shutting down Freeway and that they should terminate any client applications that are accessing Freeway and then log out.
2. After all users have logged out, select the Logout option from the Freeway Interactive Menu.
3. If you need to replace any components, power down the Freeway unit and unplug the AC power cord.
4. After making your modifications, replace the power cord and power up the Freeway unit. Startup proceeds automatically as described previously in Section 4.1.1.

4.2 Freeway Interactive Menu

After you log in as described in Section 4.1.1 on page 118, the Freeway Interactive Menu is displayed as shown in Figure 4–1. Items 1 through 7 have their own menus as described in the following sections. The Disk Drive option is not displayed if your Freeway does not contain a disk drive. The VxWorks Shell option is only displayed if the vxworks_shell parameter in the boot configuration file is set to TRUE at boot time. The Example SRA Menu option is only displayed if the example SRA is loaded and run using the sra_module and sra_entry parameters in the boot configuration file.

If you logout from the Freeway local console, you return to the Freeway User Login prompt. If you logout from an rlogin or telnet session, you return to your system prompt.

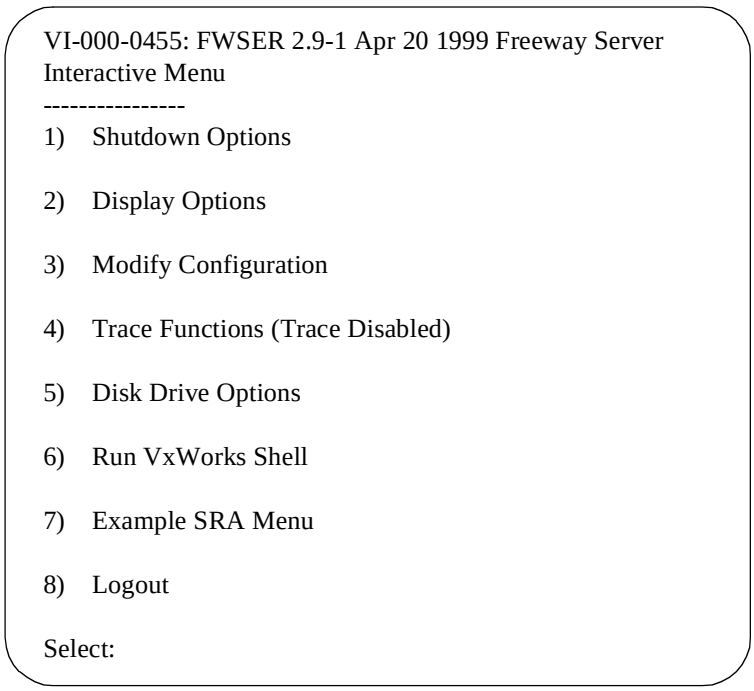

Figure 4–1: Sample Freeway Interactive Menu

Note

After entering a selection in a Freeway menu, press <return>. For example, to select the first menu choice, enter 1 then press <return>.

4.3 Shutdown Options

To access the Shutdown Options menu as shown in Figure 4–2, enter ‘1’ at the Freeway Interactive Menu.

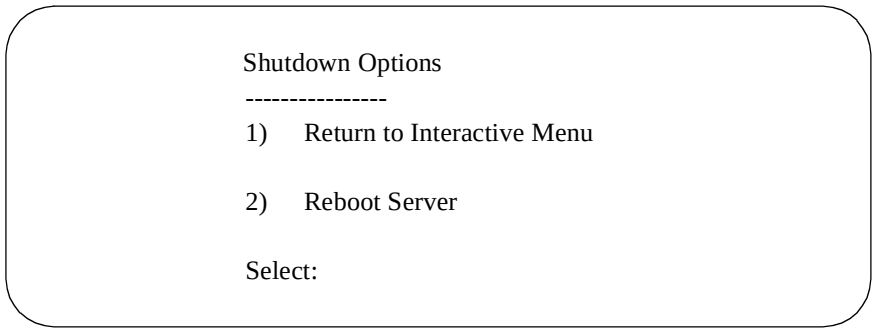

Figure 4–2: Shutdown Options Menu

4.3.1 Reboot Server

To reboot the Freeway server, enter ‘2’ at the Shutdown Options menu. All currently running tasks are terminated immediately.

Note

After power up or during reboot, Freeway first executes system diagnostics. If the diagnostics are successful, the boot process is performed automatically.

During the boot process, the boot server downloads operational software to Freeway. The downloading is performed across an Ethernet network using TCP/IP and related facilities including the file transfer protocol (FTP) or remote shell (RSH). During the boot process, status information is available at the local console display, if one is currently installed. If you have used rlogin or telnet to log in to Freeway from another com-

puter on the network, the connection to Freeway is broken when the boot process begins and you must log in again. The following operations occur during system boot:

Step 1: Determine the Boot Parameters

Freeway must know its boot parameters in order to download files from the boot server. Freeway obtains the boot parameters from local non-volatile memory. Boot parameters are initially configured during hardware installation, but they can be changed using the Modify Boot Parameters menu (Section 4.5.1 on page 148).

Step 2: Download and Start the System Boot File

After obtaining the boot parameters, Freeway requests the system boot file (freeway/boot/fw486 for Freeway 1100/1150/1200/1300, freeway/boot/fw162 for a Freeway 2000/4000/8800 with an MVME 162 CPU, or fw2604 for a Freeway 2000/4000/8800 with an MVME 2600 CPU) from the boot server. The system boot file contains the server's base operating system, networking software, and server management facilities. Freeway receives the system boot file and starts the operating system and network software. Next the server management tasks are started, including SNMP, telnet, rlogin, and the interactive server manager.

Step 3: Download the System Configuration Files

Freeway downloads two ASCII configuration files from the boot server:

- The boot configuration file defines the system configuration for physical and virtual devices and services. See Section 3.2 on page 100 for details on the boot configuration file.
    - freeway/boot/bootcfg.ip defines the configuration for any Freeway with ICP_IPs (virtual ICP devices)
    - freeway/boot/bootcfg.isa defines the configuration for a Freeway 1100 with ICP2424s (ISAbus boards)

- freeway/boot/bootcfg.pci defines the configuration for a Freeway 1100/1150/1200/1300 with ICP2432s (PCI boards)
- freeway/boot/bootcfg.vme defines the configuration for a Freeway 2000/4000/8800.

- The server TSI configuration file (freeway/boot/muxcfg[1]) describes the TSI configuration for Freeway. See Section 3.3 on page 111 for details on the muxcfg file.

Step 4: Configure the System

Freeway configures the system based on the files downloaded in Step 3:

- Freeway uses the information in the boot configuration file to configure the physical and virtual devices and services, and build the corresponding databases. Freeway then downloads the .mem object files from the boot server to the ICPs based on the download script file defined for each ICP (for example, freeway/boot/fmpload defines the download script for Freeways that use the FMP protocol).
- Freeway uses the freeway/boot/muxcfg file to configure the interface between the server software and the transport subsystem. Figure 3–2 on page 113 shows a sample muxcfg file.

1. The example server-resident application uses muxcfg.sra. The Military/Government protocol uses milmuxcfg.

4.4 Display Options

To access the Display Options menu as shown in Figure 4–3, enter ‘2’ at the Freeway Interactive Menu.

```
Display Options
---------------
1)      Return to Interactive Menu

2)      Display Log Messages

3)      Display Configuration

4)      Display Network Information

5)      Display System Information

6)      Display Network Statistics

7)      Display User Names

8)      Display Current System Time

Select:
```

Figure 4–3: Display Options Menu

4.4.1 Display Log Messages

To retrieve and display log messages stored on the message queue, enter ‘2’ at the Display Options menu.

Note

Displaying the log messages also purges them.

The latest status or error messages are displayed in increments of 10 messages. You can quit at any time by pressing ‘q’ or ‘Q’, or you can view the next 10 messages by pressing <return>.

4.4.2 Display Configuration

To access the Display Configuration menu as shown in Figure 4–4, enter ‘3’ at the Display Options menu.

```
Display Configuration
---------------------
1)    Return to Display Options Menu

2)    Display Physical Configuration

3)    Display Service Provider Configuration

4)    Display Boot Parameters

Select:
```

Figure 4–4: Display Configuration Menu

4.4.2.1 Display Physical Configuration

To display the current values for each device in the Freeway server, enter ‘2’ at the Display Configuration menu. Figure 4–5 is a sample display for one device on a Freeway 1100.

Freeway maintains information on each physical device installed in the system. The physical configuration database is initially configured at boot time by Freeway, which reads and parses the boot configuration file described in Chapter 3. This information is then loaded into Freeway’s database.

```
Physical Device Configuration
-----------------------------
Device Type              =  icp2432
Device Name              =  icp0
Slave Address            =  0x14
Physical Status          =  DEVICE_AVAILABLE

Enter 'n <RETURN>' to display next device
Enter 'p <RETURN>' to display previous device
Press RETURN to exit display:
```

Figure 4–5: Display Physical Configuration

4.4.2.2 Display Service Provider Configuration

To display the current values for each service provider in the Freeway server, enter '3' at the Display Configuration menu. Figure 4–6 is a sample display for one service provider on a Freeway 1100.

Freeway maintains information on each service provider installed in the system. The service configuration database is initially configured at boot time by Freeway, which reads and parses the boot configuration file described in Chapter 3. This information is then loaded into Freeway's database.

```
System Version  = VI-000-0455: FWSER 2.9-1 Apr 20 1999 Freeway Server
Boot Version    = VI-100-0448: FWSER 2.9-0 Mar 30 1999 Freeway Boot System


Service Configuration
---------------------
Device Name     = icp0
Service Status  = SERVICE_DOWNLOAD_COMPLETE
Download Script = spsload

Download file 1 = xio_2432.mem
Version file  1 =  VI-100-0370: OSIMPACT 3.6-0  07/29/98 (ICP2432)

Download file 2 = sps_fw_2432.mem
Version file  2 = VI-100-0456 SPS 3.10-4 Freeway Protocol Toolkit 27-Apr-99

Download file 3 = buffer.size
Version file  3 = No version string found on download

Enter 'n <RETURN>' to display next service provider
Enter 'p <RETURN>' to display previous service provider
Press RETURN to exit display:
```

Figure 4–6: Display Service Provider Configuration

4.4.2.3 Display Boot Parameters

To display the current Freeway boot parameters, enter ‘4’ at the Display Configuration menu. Figure 4–7 is a sample display for a Freeway 1100.

```
Freeway System Boot Parameters
------------------------------
Boot Device                 :   elt0,3
Processor Number            :   0
FTP User Name               :   freeway
FTP Password                :   password
Flags                       :   0
Freeway Server Name         :   freeway1
Freeway Inet Address        :   192.168.45.6
Freeway Subnet Mask         :   ffffff00
Boot Server Name            :   bootmaster
Boot Server Inet Address    :   192.168.45.1
System Boot Directory       :   /usr/local/freeway/boot
System Boot File Name       :   fw486
Configuration File Name     :   bootcfg.pci
Secondary Net Interface     :
Gateway Inet Address        :

   Press RETURN to continue
```

Figure 4–7: Display System Boot Parameters

4.4.3 Display Network Information

To access the Display Network Information menu as shown in Figure 4–8, enter ‘4’ at the Display Options menu.

```
Display Network Information
---------------------------
1)    Return to Display Options Menu

2)    Display IP Network Interface Information

3)    Display IP Network Hosts

4)    Display IP Network Routing Tables

5)    Ping another IP Host

Select:
```

Figure 4–8: Display Network Information Menu

4.4.3.1 Display IP Network Interface Information

To display the IP network interface information as shown in Figure 4–9, enter ‘2’ at the Display Network Information menu. This figure shows the display for a Freeway 1100 booting from the primary Ethernet interface. “elt” in the figure refers to the interface type as defined in the Boot Device parameter of the System Boot Parameters menu described in Section 4.5.1 on page 153. Network information for all attached interfaces is displayed, including the boot device as well as any additional interfaces specified with the added_interface_type parameter in the boot configuration file. .

```
IP Network Interface Information
--------------------------------
elt (unit number 0):
    Flags: (0x63) UP BROADCAST ARP RUNNING
    Type: ETHERNET_CSMACD
    Internet address: 207.67.135.28
    Broadcast address: 207.67.135.255
    Netmask 0xffffff00 Subnetmask 0xffffff00
    Ethernet address is 00:60:97:81:82:e3
    Metric is 0
    Maximum Transfer Unit size is 1500
    14025 packets received; 153 packets sent
    13841 multicast packets received
    0 multicast packets sent
    0 input errors; 0 output errors
    0 collisions; 0 dropped
lo (unit number 0):
    Flags: (0x8069) UP LOOPBACK MULTICAST ARP
RUNNING
    Type: SOFTWARE_LOOPBACK
    Internet address: 127.0.0.1
    Netmask 0xff000000 Subnetmask 0xff000000
    Metric is 0
    Maximum Transfer Unit size is 32768
    0 packets received; 0 packets sent
    0 multicast packets received
    0 multicast packets sent
    0 input errors; 0 output errors
    0 collisions; 0 dropped

   Press RETURN to continue
```

Figure 4–9: Display IP Network Interface Information

4.4.3.2 Display IP Network Hosts

To display the IP network hosts as shown in Figure 4–10, enter ‘3’ at the Display Network Information menu.

```
IP Network Hosts
----------------
hostname        inet address      aliases
--------        ------------      -------
freeway1         192.9.200.169
localhost        127.0.0.1
antares          192.9.200.49

   Press RETURN to continue
```

Figure 4–10: Display IP Network Hosts

4.4.3.3 Display IP Network Routing Tables

To display the IP network routing tables as shown in Figure 4–11, enter ‘4’ at the Display Network Information menu.

```
IP Network Routing Tables
-------------------------

ROUTE NET TABLE
destination     gateway         flags  Refcnt  Use      Interface
-------------------------------------------------------------------
192.9.200.0     192.9.200.169   1      1       1023     ei0
-------------------------------------------------------------------

ROUTE HOST TABLE
destination     gateway         flags  Refcnt  Use      Interface
-------------------------------------------------------------------
127.0.0.1       127.0.0.1       5      0       0        lo0
-------------------------------------------------------------------

   Press RETURN to continue
```

Figure 4–11: Display IP Network Routing Tables

4.4.3.4 Ping Another IP Host

To ping another IP host as shown in Figure 4–12, enter ‘5’ at the Display Network Information menu. You must enter either an IP address in decimal dot notation (for example, 192.168.123.134) or a hostname known to the Freeway system.

```
Ping another IP Host
--------------------
  Enter host to ping
  (dot-separated IP address or hostname): 192.168.123.134

Attempting to ping "192.168.123.134" ...

192.168.123.134 is alive.

   Press RETURN to continue
```

Figure 4–12: Ping Another IP Host

4.4.4 Display System Information

To access the Display System Information menu as shown in Figure 4–13, enter ‘5’ at the Display Options menu.

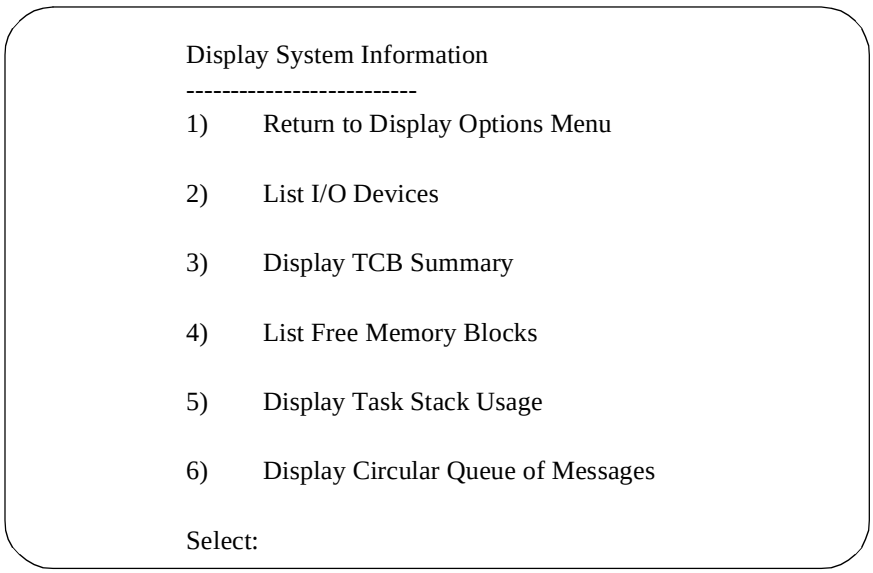

Figure 4–13: Display System Information Menu

4.4.4.1 List I/O Devices

To list the I/O devices as shown in Figure 4–14, enter ‘2’ at the Display System Information menu.

```
I/O Devices
-----------
drv name
  0 /null
  1 /tyCo/0
  1 /tyCo/1
  5 /ram1/
  5 /sd6/
  7 antares:
  2 /dev/pty.0S
  3 /dev/pty.0M
  2 /dev/pty.1S
  3 /dev/pty.1M
  2 /dev/pty.2S
  3 /dev/pty.2M
  2 /dev/pty.3S
  3 /dev/pty.3M
  8 icp0
  4 /pipe/muxtrc
  4 /pipe/freeway1

    Press RETURN to continue
```

Figure 4–14: List I/O Devices

4.4.4.2 Display TCB Summary

To display the task control block (TCB) summary as shown in Figure 4–15, enter '3' at the Display System Information menu.

```
TCB Summary
-----------

  NAME       ENTRY      TID      PRI   STATUS     PC      SP     ERRNO  DELAY
---------- ------------ -------- --- ---------- -------- -------- ------- -----
tExcTask   1a2200              fe9e8c     0 PEND        1bd6bc   fe9dfc       0     0
tLogTask   177468        fe4e64   0 PEND         1bd6bc   fe4dd0       0     0
tNetTask   17bd80        e816ec  50 PEND         163b00   e81694      3d     0
tFtpdTask  196828        e64978  55 PEND         163b00   e648ac       0     0
icp_helper 146b88        e516c4  99 PEND+T       163b00   e51678  3d0004     2
tSnmpd     199fd0        e618cc 100 PEND         163b00   e60f50       0     0
inetd      147ea4        e4c554 100 PEND         163b00   e4c43c       0     0
ledDriver  147b14        e4b024 100 DELAY        17df46   e4afdc       0    59
msg_mux    151ecc        e4876c 100 PEND+T       163b00   e48728  3d0002   491
MIBupdate  141c90        e3d30c 100 PEND+T       163b00   e3d2c8  3d0002  1482
freeway_0  12ab00        d82310 100 PEND+T       163b00   d822bc  3d0002    65
tSoce4876c 12b300        d7f968 100 PEND+T       163b00   d7f880  3d0004   130
tClne3d30c 12ad00        d52a74 100 PEND+T       163b00   d52a34  3d0002  1777
clogin     146848        d4ef68 100 DELAY        17df46   d4ee6c  360003     6
int_act    149500        e4ee0c 100 READY        1823a0   e4df24       0     0

  Press RETURN to continue
```

Figure 4–15: TCB Summary

4.4.4.3 List Free Memory Blocks

To list the free memory blocks as shown in Figure 4–16, enter ‘4’ at the Display System Information menu.

```
Free Memory Blocks
------------------

FREE LIST:
  num     addr      size
  --- ---------- ----------
    1   0x37a5dc       288
    2   0x37a8fc       288
    3   0x379abc      2240
    4   0x3ff7cc       576
    5   0x3ff58c       356
    6   0x3fd8f8       796
    7    0xb7784   2553360

SUMMARY:
 status   bytes    blocks   avg block  max block
 ------ --------- -------- ---------- ----------
current
   free  2557904       7     365414   2553360
  alloc   884884     195       4537         -
cumulative
  alloc  1090844     479       2277         -

   Press RETURN to continue
```

Figure 4–16: List Free Memory Blocks

4.4.4.4 Display Task Stack Usage

To display the task stack usage as shown in Figure 4–17, enter ‘5’ at the Display System Information menu.

```
Task Stack Usage
----------------

  NAME       ENTRY       TID     SIZE   CUR  HIGH  MARGIN
------------ ------------ -------- ----- ----- ----- ------
tExcTask     0x00001a2200 fe9e8c    7988   144   220   7768
tLogTask     0x0000177468 fe4e64    4988   148   916   4072
tNetTask     0x000017bd80 e816ec    9988    88   948   9040
tFtpdTask    0x0000196828 e64978   11988   204   276  11712
icp_helper   0x0000146b88 e516c4    9988    76   356   9632
tSnmpd       0x0000199fd0 e618cc   28664  2428  2628  26036
inetd        0x0000147ea4 e4c554    4992   280   500   4492
ledDriver    0x0000147b14 e4b024    9988    72   272   9716
msg_mux      0x0000151ecc e4876c    9324    68  2116   7208
MIBupdate    0x0000141c90 e3d30c    3416    68  3408      8
freeway_0    0x000012ab00 d82310    9560    84   896   8664
tSoce4876c   0x000012b300 d7f968   10228   232   452   9776
tClne3d30c   0x000012ad00 d52a74    9560    64  1020   8540
clogin       0x0000146848 d4ef68    9324   252  1032   8292
int_act      0x0000149500 e4ee0c    9324  3716  3916   5408
INTERRUPT                          1000     0     0   1000

  Press RETURN to continue
```

Figure 4–17: Display Task Stack Usage

4.4.4.5 Display Circular Queue of Messages

To display the circular queue of messages as shown in Figure 4–18, enter ‘6’ at the Display System Information menu. This shows the last 300 messages sent to the Freeway log.

```
 Display Circular Log Messages
---------------------------

STATUS:  SNMP running
STATUS:  Reading device configuration file
STATUS:  Processing device configuration file
STATUS:  Reading TSI configuration file
STATUS:  Processing TSI configuration file
STATUS:  Result file: /ram1/muxcfg.bin
STATUS:  Device Configuration Complete
STATUS:  Diagnostics Passed on icp0
STATUS:  icpLoad: Download to device icp0
STATUS:  Processing /usr/local/freeway/boot/spsload

Messages Remaining in Queue = 15

Enter 'q' to quit or Return to continue:

STATUS:  icpLoad: LOAD file /usr/local/freeway/icpcode/icp6000/osimpact/ xio_6000.mem at 40001200
STATUS:  icpLoad: LOAD file /usr/local/freeway/icpcode/icp6000/protocols/
sps_fw_6000.mem at 40018000
STATUS:  icpLoad: LOAD file /usr/local/freeway/icpcode/icp6000/protocols/
buffer.size at 400d0000
STATUS:  icpLoad: No version string found with this file.
STATUS:  icpLoad: INIT procedure at 40018000
STATUS:  icpLoad: Download complete
STATUS:  Diagnostics Passed on icp1
STATUS:  icpLoad: Download to device icp1
STATUS:  Processing /usr/local/freeway/boot/spsload
STATUS:  icpLoad: LOAD file /usr/local/freeway/icpcode/icp6000/osimpact/
xio_6000.mem at 40001200

Messages Remaining in Queue = 5

Enter 'q' to quit or Return to continue:

STATUS:  icpLoad: LOAD file /usr/local/freeway/icpcode/icp6000/protocols/
sps_fw_6000.mem at 40018000
STATUS:  icpLoad: LOAD file /usr/local/freeway/icpcode/icp6000/protocols/
buffer.size at 400d0000
STATUS:  icpLoad: No version string found with this file.
STATUS:  icpLoad: INIT procedure at 40018000
STATUS:  icpLoad: Download complete
```

Figure 4–18: Display Circular Queue of Messages

4.4.5 Display Network Statistics

To access the Display Network Statistics menu as shown in Figure 4–19, enter ‘6’ at the Display Options menu.

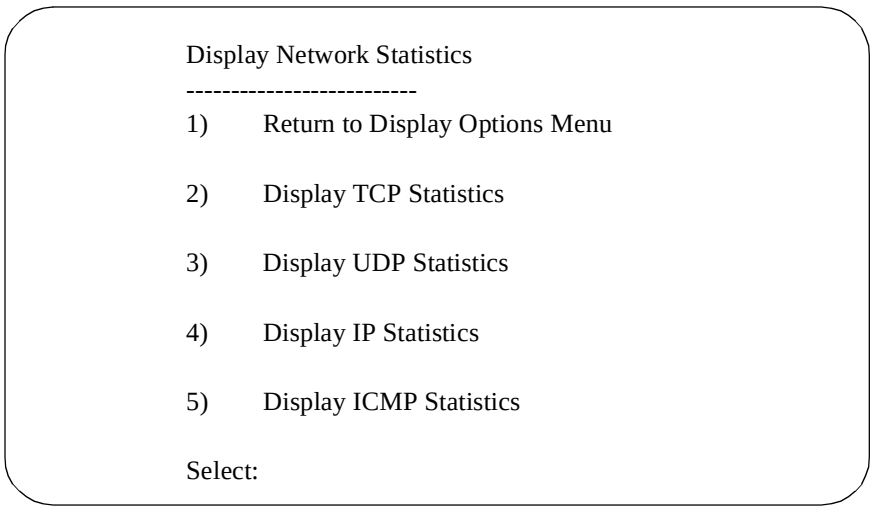

Figure 4–19: Display Network Statistics Menu

4.4.5.1 Display TCP Statistics

To display the transmission control protocol (TCP) statistics as shown in Figure 4–20, enter ‘2’ at the Display Network Statistics menu.

```
TCP Statistics
--------------
TCP:
        1019 packets sent
                632 data packets (64040 bytes)
                0 data packet (0 byte) retransmitted
                254 ack-only packets (184 delayed)
                0 URG only packet
                0 window probe packet
                93 window update packets
                40 control packets
        1138 packets received
                689 acks (for 64056 bytes)
                29 duplicate acks
                0 ack for unsent data
                747 packets (235569 bytes) received in-sequence
                4 completely duplicate packets (0 byte)
                0 packet with some dup. data (0 byte duped)
                3 out-of-order packets (0 byte)
                0 packet (0 byte) of data after window
                0 window probe
                2 window update packets
                4 packets received after close
                0 discarded for bad checksum
                0 discarded for bad header offset field
                0 discarded because packet too short
        5 connection requests
        32 connection accepts
        37 connections established (including accepts)
        44 connections closed (including 0 drop)
        2 embryonic connections dropped
        688 segments updated rtt (of 698 attempts)
        1 retransmit timeout
                0 connection dropped by rexmit timeout
        0 persist timeout
        2 keepalive timeouts
                0 keepalive probe sent
                0 connection dropped by keepalive

    Press RETURN to continue
```

Figure 4–20: Display TCP Statistics

4.4.5.2 Display UDP Statistics

To display the user datagram protocol (UDP) statistics as shown in Figure 4–21, enter '3' at the Display Network Statistics menu.

```
UDP Statistics
--------------
UDP:
        1786 total packets
        1786 input packets
        0 output packets
        0 incomplete header
        0 bad data length field
        0 bad checksum
        1786 broadcasts received with no ports
        0 full socket

    Press RETURN to continue
```

Figure 4–21: Display UDP Statistics

4.4.5.3 Display IP Statistics

To display the Internet protocol (IP) statistics as shown in Figure 4–22, enter ‘4’ at the Display Network Statistics menu.

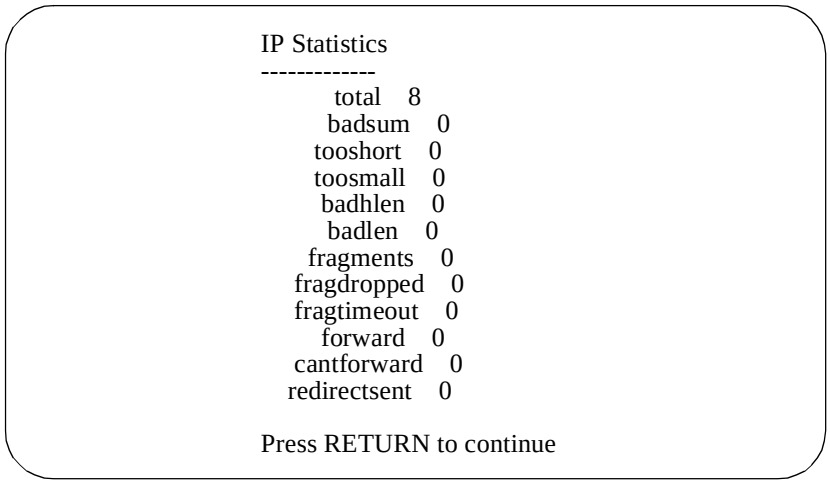

Figure 4–22: Display IP Statistics

4.4.5.4 Display ICMP Statistics

To display the ICMP statistics as shown in Figure 4–23, enter ‘5’ at the Display Network Statistics menu.

```
ICMP Statistics
---------------
ICMP:
        0 call to icmp_error
        0 error not generated because old message was icmp
        0 message with bad code fields
        0 message < minimum length
        0 bad checksum
        0 message with bad length
        0 message response generated

    Press RETURN to continue
```

Figure 4–23: Display ICMP Statistics

4.4.6 Display User Names

To display the user names for the Freeway server as shown in Figure 4–24, enter ‘7’ at the Display Options menu.

```
Users
-----
freeway1
freeway2
freeway3

Press RETURN to continue
```

Figure 4–24: Display User Names

4.4.7 Display Current System Time

To display the current system time for the Freeway server as shown in Figure 4–25, enter ‘8’ at the Display Options menu.

```
                YYYY MM DD HH:MM:SS
Current system time:  1999 01 19 10:05:26


Press RETURN to continue
```

Figure 4–25: Display Current System Time

4.5 Modify Configuration

To access the Freeway Modify Configuration menu as shown in Figure 4–26, enter ‘3’ at the Freeway Interactive Menu.

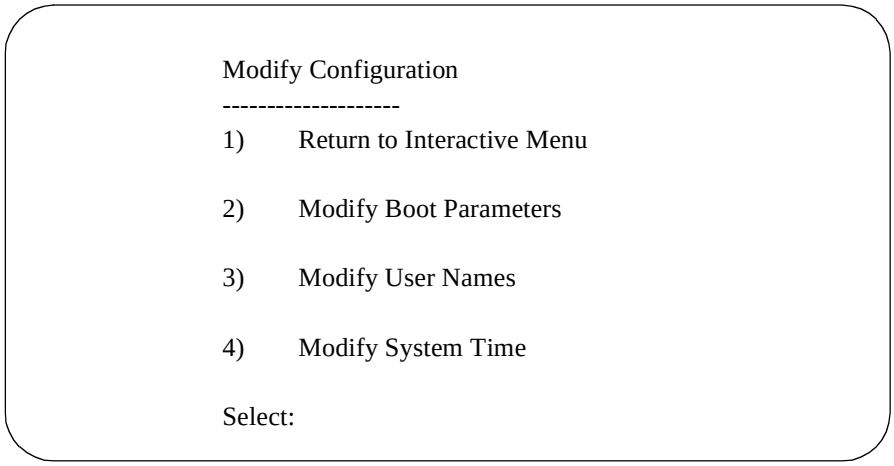

Figure 4–26: Modify Configuration Menu

4.5.1 Modify Boot Parameters

To modify the Freeway boot parameter settings, enter '2' at the Modify Configuration menu. Figure 4–27 shows typical boot parameter settings for a Freeway 2000. Any changes made to these parameters are stored in Freeway's non-volatile memory. Table 4–1 describes each parameter. Three actions are possible as each parameter is displayed:

- To preserve a parameter, press <return>
- To edit a parameter, type in the new alpha-numeric information followed by <return>
- To null out a parameter, press the period key ('.') followed by <return>

After scrolling through all the parameters, type '**yes**' to save the changes or '**no**' to cancel. The System Boot Parameters are then redisplayed as modified.

```
Freeway System Boot Parameters
------------------------------

Enter '.' to erase parameter
Enter '<RETURN>' for no parameter change


Boot Device                 :   ei
Processor Number            :   0
FTP User Name               :   freeway
FTP Password                :   password
Flags                       :   0
Freeway Server Name         :   freeway2
Freeway Inet Address        :   192.168.45.6
Freeway Subnet Mask         :   ffff0000
Boot Server Name            :   bootmaster
Boot Server Inet Address    :   192.168.45.1
System Boot Directory       :   /usr/local/freeway/boot
System Boot File Name       :   fw162
Configuration File Name     :   bootcfg.vme
Secondary Net Interface     :
Gateway Inet Address        :

Save modifications?

Enter 'yes <RETURN>' to save modifications
Enter 'no <RETURN>' to prevent modifications:
```

Figure 4–27: Modify Boot Parameters

Table 4–1: Freeway System Boot Parameter Descriptions

Boot Parameter	Description
Boot Device	Freeway 1100/1150/1200/1300: • to boot over Ethernet from the boot server using the primary 3Com Etherlink III network interface card (NIC), set the boot device to one of the following depending on the physical connector you will be using: **elt,1** to use the AUI connection **elt,2** to use the BNC connection **elt,3** to use the RJ45 connection • to boot over Ethernet from the boot server using the secondary 3Com Etherlink III network interface card (NIC), set the boot device to one of the following: **elt1,1** to use the AUI connection **elt1,2** to use the BNC connection **elt1,3** to use the RJ45 connection • to boot over Fast Ethernet from the boot server using the primary Intel EtherExpress Pro/100 NIC, set the boot device to **fei** • to boot over Fast Ethernet from the boot server using the secondary Intel EtherExpress Pro/100 NIC, set the boot device to **fei1** • to boot from the internal IDE disk, set the boot device to **ide=0,0** Freeway 2000/4000/8800 with an MVME 162 CPU: • to boot over Ethernet from the primary Ethernet interface, set the boot device to **ei** • to boot over Ethernet from the secondary Ethernet interface, set the boot device to **ln** • • to boot over FDDI from the boot server, set the boot device to **sxp** • to boot from the internal hard disk, set the boot device to **scsi=6,0** Freeway 2000/4000/8800 with an MVME 2600 CPU: • to boot over Ethernet from the primary fast Ethernet interface, set the boot device to **dc** • to boot over Ethernet from the secondary fast Ethernet interface, set the boot device to **dc1** • to boot from the internal hard disk, set the boot device to **scsi=6,0**

Table 4–1: Freeway System Boot Parameter Descriptions *(Cont'd)*

Boot Parameter	Description
Processor Number	This parameter is the number of server processors in the Freeway server minus one. Currently, a Freeway server can support only one server processor. *The only valid number for this parameter is 0.*
FTP User Name	If booting from the boot server, Freeway uses this name to log in to its FTP (or RSH). The default is **freeway**. This is not required if you are booting from the local disk.
FTP Password	If booting from the boot server, Freeway uses this password to log in to its user account. The default is **password**. This parameter is optional. If a password is given, FTP is used during system boot; if it is cleared, the remote shell (RSH) protocol is used.
Flags	This parameter specifies whether you want Freeway to: • Autoboot two seconds after system reset, seven seconds after system reset, or not at all • Display the version numbers of the .mem files • Force the primary boot network interface to operate at 10 megabits/second, half duplex Enter the Flags value shown in Table 4–2 on page 153 that matches your configuration requirements. The default Flags value is 0. The Flags word is an inclusive "OR" of the desired bits for the individual functions.
Freeway Server Name	Enter the system name assigned by the system administrator for this Freeway.
Freeway Inet Address	Enter the Internet address assigned by the system administrator for this Freeway in decimal dot notation (for example, 207.67.135.84).
Freeway Subnet Mask	If your Freeway is located on a subnet, enter the subnet mask in hexa-decimal format (for example, ffffff00).
Boot Server Name	Enter the name assigned by the system administrator for the boot server. Optionally, you can clear this field and the software will assign the default name "bootserver." See Section 2.1.3 on page 34. If you are booting from the local disk, this parameter is ignored.
Boot Server Inet Address	Enter the Internet address assigned by the system administrator for the boot server in decimal dot notation (for example, 207.67.135.84). If you are booting from the local disk, this parameter is ignored.

Table 4–1: Freeway System Boot Parameter Descriptions *(Cont'd)*

Boot Parameter	Description
System Boot Directory	If the Freeway boot files will be stored in the home directory of the FTP (or RSH) user account, clear this field. Otherwise, enter the full path name of the boot directory. The default UNIX directory is /usr/local/freeway/boot. The default VMS directory is SYS$SYSDEVICE:[FREEWAY.BOOT]. For Windows NT versions earlier than 4.0, the default directory is c:\freeway\boot. For Windows NT 4.0 or later, use the alias you have set up to point to the freeway\boot directory. To boot a Freeway 1100/1150/1200/1300 from the local disk, set the system boot directory to **/ide**. To boot a Freeway 2000/4000/8800 from the local disk, set the system boot directory to **/sd6/**.
System Boot File Name	Enter the system boot file name for this Freeway: • For a Freeway 1100/1150/1200/1300, the default is **fw486** • For a Freeway 2000/4000/8800 with an MVME 162 CPU, the default is **fw162** • For a Freeway 2000/4000/8800 with an MVME 2600 CPU, the default is **fw2604**
Configuration File Name	Enter the name of the file Freeway uses to configure the physical or virtual devices and services: • For a Freeway 1100 with ICP2424s, the default is **bootcfg.isa** • For a Freeway 1100/1150/1200/1300 with ICP2432s, the default is **bootcfg.pci** • For a Freeway 2000/4000/8800, the default is **bootcfg.vme** • For any Freeway using ICP_IP virtual ICP devices, the default is **bootcfg.ip**
Secondary Network Interface	If the Boot Device is a local area network device (boot server), the Secondary Network Interface parameter should be cleared, which is the default. If the Boot Device is the hard or flash disk, this parameter specifies the local area network device to be used after Freeway boots. The values used to define your network interface device are the same as those defined for the Boot Device parameter on page 150.

Table 4–1: Freeway System Boot Parameter Descriptions *(Cont'd)*

Boot Parameter	Description
Gateway Inet Interface	If your Freeway and boot server are on the same network, clear this parameter, which is the default. If they are on different networks, enter the IP address of the gateway processor on the Freeway's network that provides access to the boot server's network.

Table 4–2: Flags for Reset Action

Flags Parameter Value	Reset Action
0x0000 (default)	Upon system reset, wait 7 seconds before autobooting.
0x0004	Upon system reset, display the Freeway Boot System Main Menu. Do not autoboot.
0x0008	Upon system reset, wait 2 seconds before autobooting.
0x1000	Display version numbers of .mem files downloaded to an ICP during boot. The Flags word is an inclusive "OR" of the desired bits for the individual functions; for example, 0x1008 waits 2 seconds before autobooting and displays the version numbers.
0x2000	Force primary boot network interface to operate at 10 megabits/second, half duplex. The Flags word is an inclusive "OR" of the desired bits for the individual functions; for example, 0x2008 waits 2 seconds before autobooting and forces the 10 megabits/second speed.

4.5.2 Modify User Names

To modify the Freeway user names, enter '3' at the Modify Configuration menu. The Modify User Names menu is shown in Figure 4–28. You can then select '2' to add a user name or '3' to delete one. In either case, you are prompted to enter the user name, then asked to enter the password twice. There can be up to 10 user names. User names can be up to 80 characters in length and can include spaces. Passwords must be at least 8 characters in length and no more than 40 characters.

When you first install Freeway, the default user name (simpact) and password (password) are in effect. Changes made with the Modify User Names menu modify the permanent User/Password table. This table is checked each time Freeway is rebooted. If all user names are removed or the table becomes corrupted, the User/Password table will automatically be rebuilt the next time Freeway is rebooted and the default user name and password will again be in effect.

Caution

The Freeway user name and password are used to access the Freeway Interactive Menu. They are not to be confused with the FTP user name and FTP password (which have defaults of freeway and password). The latter are Freeway system boot parameters which are used between Freeway and the boot server during system boot (see Section 4.5.1 on page 148).

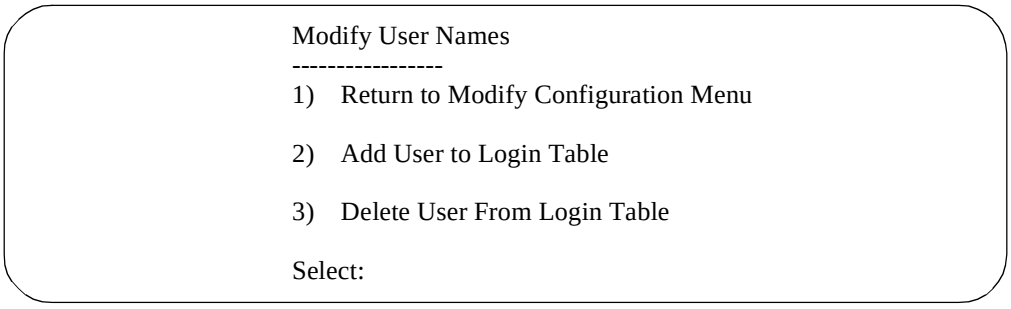

Figure 4–28: Modify User Names

4.5.3 Modify System Time

To modify the current system time for the Freeway server as shown in Figure 4–29, enter ‘4’ at the Modify Configuration menu and type in the date and time in the same format as shown on the screen.

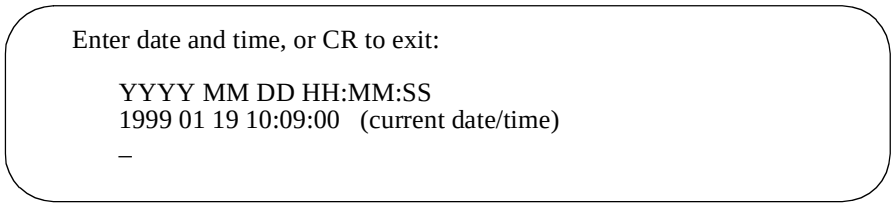

Figure 4–29: Modify System Time

4.6 Trace Functions

The current trace status is shown in parentheses in the Trace Function option in the Freeway Interactive Menu. To access the Trace Functions menu as shown in Figure 4–31, enter ‘4’ at the Freeway Interactive Menu.

Enter ‘2’ to turn trace on. Freeway then saves messages moving to and from the client in a circular buffer. When trace data fills the buffer, the oldest trace data is overwritten with new trace data.

Note

To capture the trace data to a file on the boot server, the user defined in FTP User Name in the System Boot Parameters menu (page 149) must have write privileges in the system boot directory on the boot server.

Enter ‘3’ to turn trace off, then enter ‘4’ to process the trace data. The messages in the trace buffer are in binary form to save space. The messages are converted to ASCII before being written to the boot server.

All messages are TSI messages. The TSI data area can encapsulate a DLI message, which gives you more information. The messages can be interpreted in the following ways:

- as a TSI header and a TSI data area
- as a TSI header, a TSI data area, a DLI header, and a DLI data area

You are prompted for the trace level, TSI or DLI. Refer to the *Freeway Data Link Interface Reference Guide* or *Freeway Transport Subsystem Interface Reference Guide* for trace information examples. You are then prompted to enter a file name and press <return>. A ‘snapshot’ of the current trace data is then written to the specified file located in the system boot directory on the boot server. For the path name of this directory, see the Display Boot Parameters screen (page 129).

If you booted Freeway from a local disk, you can use the File Transfer Protocol to move the file from the local disk to your local directory. Figure 4–30 shows an example using a Freeway 1100. If you are using a Freeway 2000/4000/8800, the directory is /sd6/, with the slash at both ends, rather than /ide.

```
antares% ftp freeway1
Connected to freeway1.
220 VxWorks (5.1.1) FTP server ready
Name: simpact
331 Password required
Password:
230 User logged in
ftp> cd /ide
250 Changed directory to "/ide"
ftp> dir
200 Port set okay
150 Opening ASCII mode data connection
  size         date       time       name
--------      ------     ------    --------
     0    Sep-17-1996  03:33:24   FMPLOAD
  4403    Sep-17-1996  03:33:24   BOOTCFG.ISA
   241    Sep-17-1996  03:33:24   FMPLOAD
  3657    Sep-17-1996  03:33:24   BOOTCFG.ISA
  1019    Sep-17-1996  03:33:24   muxcfg
   221    Sep-17-1996  03:33:24   fmpload
    28    Sep-17-1996  03:33:24   trace.sps

226 Transfer complete
532 bytes received in 0.1 seconds (5 Kbytes/s)
ftp> get trace.sps
200 Port set okay
150 Opening ASCII mode data connection
226 Transfer complete
local: trace.sps remote: trace.sps
32 bytes received in 0.0053 seconds (5.9 Kbytes/s)
ftp>
```

Figure 4–30: File Transfer Protocol Example

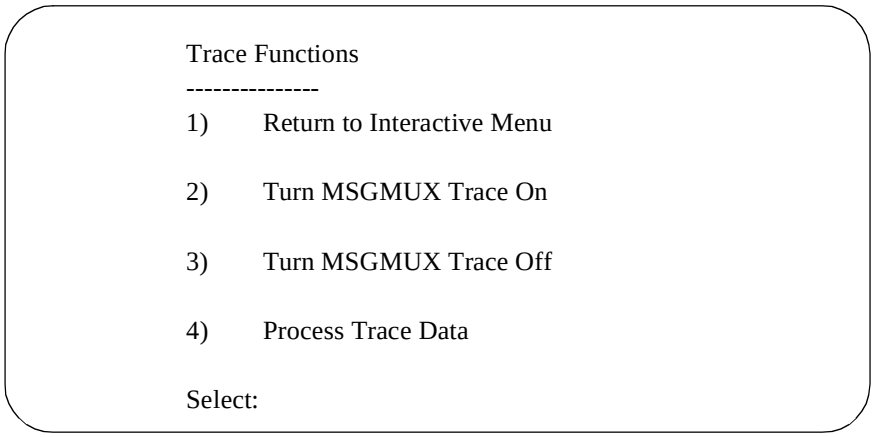

Figure 4–31: Trace Functions Menu

4.7 Disk Drive Options

To access the Disk Drive Options menu as shown in Figure 4–32, enter '5' at the Freeway Interactive Menu.

Note

If your Freeway does not have a certain drive (for example, a hard disk), the options for that drive are not displayed. On a Freeway 2000/4000/8800, the floppy menu will not be displayed until after a floppy is inserted in the floppy disk drive; after that, the menu will be displayed even if no floppy is in the drive.

```
Disk Drive Options
------------------
1)      Return to Interactive Menu

2)      Hard Disk Copy Options

3)      Hard Disk Maintenance Options

4)      Floppy Disk Copy Options

5)      Floppy Disk Maintenance Options

Select:
```

Figure 4–32: Disk Drive Options Menu

4.7.1 Hard Disk Copy Options

To access the Hard Disk Copy Options menu as shown in Figure 4–33, enter ‘2’ at the Disk Drive Options menu.

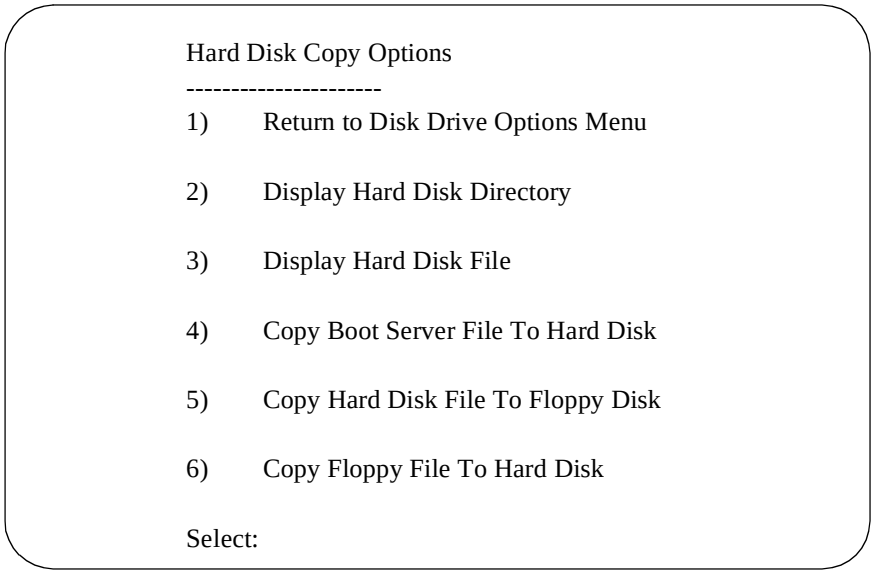

Figure 4–33: Hard Disk Copy Options Menu

4.7.1.1 Display Hard Disk Directory

To display the hard disk directory as shown in Figure 4–34, enter ‘2’ at the Hard Disk Copy Options menu.

Note

File names for the Freeway 2000/4000/8800 are case sensitive.

```
Display Disk Devices
--------------------
ID LUN VendorID    ProductID     Rev. Type  Blocks  BlkSize pScsiPhysDev
-- --- -------- ---------------- ---- ---- -------- ------- ------------
 2  0  TEAC     FC-1     HF   11 RV J   0R    2880    512    0x00792144
 6  0  MAXTOR   7245-SCSI       1761   0   479656    512    0x00790e50

Directory /ide
---------------
  size         date       time       name
--------      ------     ------    --------
 306646    APR-02-1997  16:31:28   BOOTROM.SYS
   4096    OCT-08-1996  12:33:04   NVRAM.TXT
   3703    MAR-31-1997  10:23:00   BOOTCFG.VME
   1018    APR-08-1997  13:05:16   MUXCFG
    112    MAR-31-1997  10:24:30   BSCLOAD
 880372    JAN-01-1997  09:28:20   FW486
   4198    JAN-01-1997  08:17:50   BOOTCFG.VME
   1056    JAN-01-1997  09:33:00   MUXCFG2
    259    APR-04-1997  10:10:00   X25LOAD
  12190    AUG-21-1996  09:24:20   XIO_2424.MEM
 221060    APR-04-1997  10:08:00   X25_2424.MEM

  Press RETURN to continue
```

Figure 4–34: Display Hard Disk Directory

4.7.1.2 Display Hard Disk File

To display a hard disk file as shown in Figure 4–35, enter ‘3’ at the Hard Disk Copy Options menu. If you change your mind about displaying a file, simply press <return>, then you will be prompted to press <return> again.

Note

File names for the Freeway 2000/4000/8800 are case sensitive.

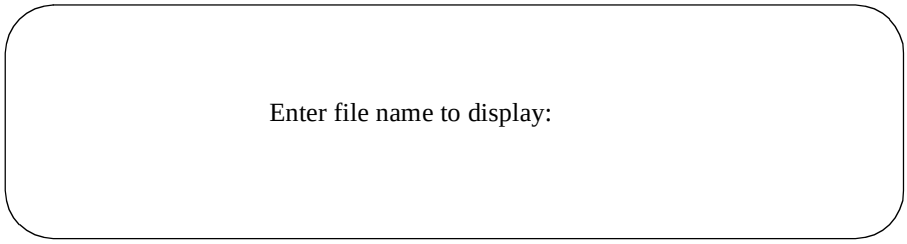

Figure 4–35: Display Hard Disk File

4.7.1.3 Copy Boot Server File to Hard Disk

To copy a boot server file to the hard disk as shown in Figure 4–36, enter '4' at the Hard Disk Copy Options menu. If you change your mind about copying a file, simply press <return>, then you will be prompted to press <return> again.

Note

The Freeway 1100/1150/1200/1300 hard disk uses an MS-DOS file system. File names must follow the DOS convention of having a base name of no more than eight characters followed by a period and an extension of no more than three characters. File names for the Freeway 1100/1150/1200/1300 are not case sensitive.

Freeway 2000/4000/8800 uses the VxWorks DOS file system long name support feature. This feature allows the use of file names longer than MS-DOS's 8.3 convention. These names can be up to 40 characters long and can be made up of any ASCII characters. In addition, a period, which in MS-DOS indicates a file-name extension, has no special significance. File names for the Freeway 2000/4000/8800 are case sensitive.

The file names bootrom.sys and nvram.txt are reserved for Freeway 1100/1150/1200/1300 use and may not be copied to or from any disk.

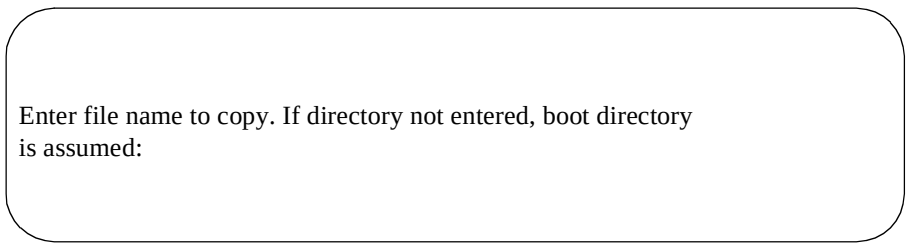

Figure 4–36: Copy Boot Server File to Hard Disk

4.7.1.4 Copy Hard Disk File to Floppy Disk

To copy a hard disk file to the floppy disk as shown in Figure 4–37, enter '5' at the Hard Disk Copy Options menu. If you change your mind about copying a file, simply press <return>, then you will be prompted to press <return> again.

Note

The Freeway 1100/1150/1200/1300 hard disk uses an MS-DOS file system. File names must follow the DOS convention of having a base name of no more than eight characters followed by a period and an extension of no more than three characters. File names for the Freeway 1100/1150/1200/1300 are not case sensitive.

Freeway 2000/4000/8800 uses the VxWorks DOS file system long name support feature. This feature allows the use of file names longer than MS-DOS's 8.3 convention. These names can be up to 40 characters long and can be made up of any ASCII characters. In addition, a period, which in MS-DOS indicates a file-name extension, has no special significance. File names for the Freeway 2000/4000/8800 are case sensitive.

The file names bootrom.sys and nvram.txt are reserved for Freeway 1100/1150/1200/1300 use and may not be copied to or from any disk. If either of these file names is on the hard disk, using * to copy all files will result in an error when Freeway attempts to copy the reserved file.

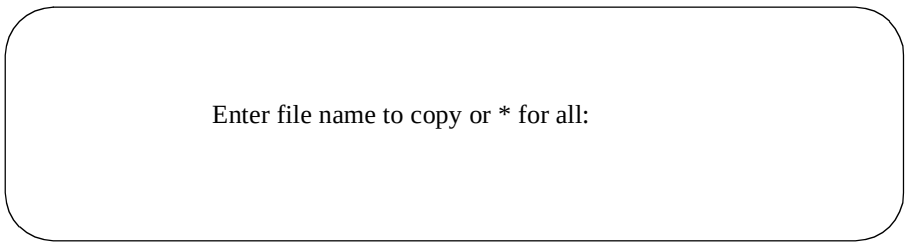

Figure 4–37: Copy Hard Disk File to Floppy Disk

4.7.1.5 Copy Floppy File to Hard Disk

To copy a floppy file to the hard disk as shown in Figure 4–38, enter '6' at the Hard Disk Copy Options menu. If you change your mind about copying a file, simply press <return>, then you will be prompted to press <return> again.

Note

The Freeway 1100/1150/1200/1300 hard disk uses an MS-DOS file system. File names must follow the DOS convention of having a base name of no more than eight characters followed by a period and an extension of no more than three characters. File names for the Freeway 1100/1150/1200/1300 are not case sensitive.

Freeway 2000/4000/8800 uses the VxWorks DOS file system long name support feature. This feature allows the use of file names longer than MS-DOS's 8.3 convention. These names can be up to 40 characters long and can be made up of any ASCII characters. In addition, a period, which in MS-DOS indicates a file-name extension, has no special significance. File names for the Freeway 2000/4000/8800 are case sensitive.

The file names bootrom.sys and nvram.txt are reserved for Freeway 1100/1150/1200/1300 use and may not be copied to or from any disk. If either of these file names is on the floppy disk, using * to copy all files will result in an error when Freeway attempts to copy the reserved file.

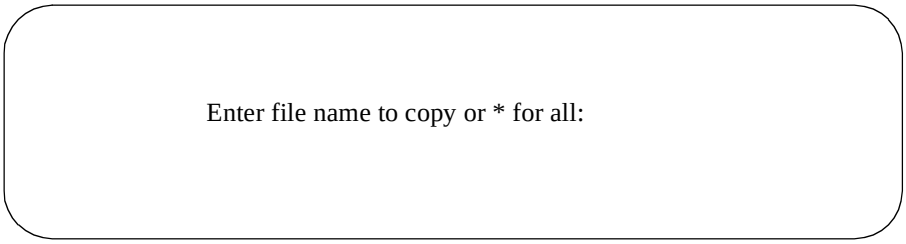

Figure 4–38: Copy Floppy File to Hard Disk

4.7.2 Hard Disk Maintenance Options

To access the Hard Disk Maintenance Options menu as shown in Figure 4–39, enter ‘3’ at the Disk Drive Options menu.

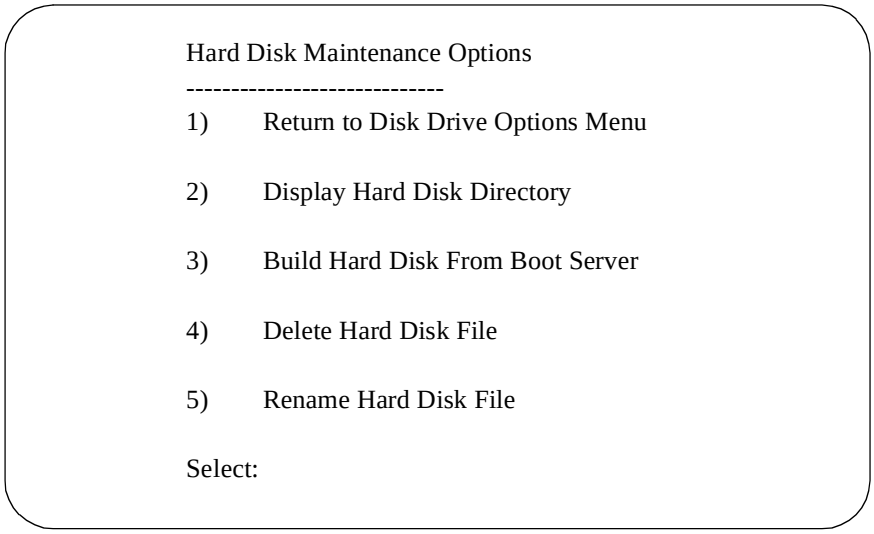

Figure 4–39: Hard Disk Maintenance Options Menu

4.7.2.1 Display Hard Disk Directory

To display the hard disk directory as shown in Figure 4–40, enter ‘2’ at the Hard Disk Maintenance Options menu.

Note

File names for the Freeway 2000/4000/8800 are case sensitive.

```
Display Disk Devices
--------------------
ID LUN VendorID    ProductID     Rev. Type  Blocks  BlkSize pScsiPhysDev
-- --- -------- ---------------- ---- ---- -------- ------- ------------
 2  0  TEAC     FC-1     HF   11 RV J   0R    2880    512    0x00792144
 6  0  MAXTOR   7245-SCSI       1761   0   479656    512    0x00790e5

Directory /ide
---------------
  size         date       time       name
--------      ------     ------    --------
 306646    APR-02-1997  16:31:28   BOOTROM.SYS
   4096    OCT-08-1996  12:33:04   NVRAM.TXT
   3703    MAR-31-1997  10:23:00   BOOTCFG.VME
   1018    APR-08-1997  13:05:16   MUXCFG
    112    MAR-31-1997  10:24:00   BSCLOAD
 880372    JAN-01-1997  07:13:00   FW486
   4198    JAN-01-1997  03:26:00   BOOTCFG.VME
   1056    JAN-01-1997  02:45:00   MUXCFG2
    259    APR-04-1997  10:10:00   X25LOAD
  12190    AUG-21-1996  04:22:00   XIO_2424.MEM
 221060    APR-04-1997  10:08:00   X25_2424.MEM

  Press RETURN to continue
```

Figure 4–40: Display Hard Disk Directory

4.7.2.2 Build Hard Disk from Boot Server

To build the hard disk from the boot server, enter '3' at the Hard Disk Maintenance Options menu.

Note

To build the hard disk, you must have previously configured a computer on your network to serve as the Freeway boot server and installed all the server and protocol software on the boot server. These procedures are explained in Chapter 2.

Table 4–3 shows a summary of the steps you must perform to build the hard disk from the boot server. Informational messages are displayed as the disk is built.

Table 4–3: Summary of Steps Required to Build a Hard Disk

Step 1: If you are using a Freeway 1100/1150/1200/1300, make sure the names of all files to be loaded on the hard disk meet the MS-DOS file naming conventions. This is not necessary for a Freeway 2000/4000/8800.
Step 2: Log on to Freeway and access the Freeway Interactive Menu.
Step 3: Modify the boot parameters so Freeway can boot from the boot server rather than from the hard disk.
Step 4: Boot Freeway from the boot server.
Step 5: Perform the "Build Hard Disk" operation.
Step 6: Modify the boot parameters so Freeway can boot from the hard disk rather than from the boot server.
Step 7: Boot Freeway from the hard disk.

The Freeway 1100/1150/1200/1300 hard disk uses an MS-DOS file system. File names must follow the DOS convention of having a base name of no more than eight characters followed by a period and an extension of no more than three characters. File names for the Freeway 1100/1150/1200/1300 are not case sensitive.

Freeway 2000/4000/8800 uses the VxWorks DOS file system long name support feature. This feature allows the use of file names longer than MS-DOS's 8.3 convention. These names can be up to 40 characters long and can be made up of any ASCII characters. In addition, a period, which in MS-DOS indicates a file-name extension, has no special significance. File names for the Freeway 2000/4000/8800 are case sensitive.

The following files are copied to the hard disk:

- the boot configuration file (for example, freeway/boot/bootcfg.vme)
- the download script file referenced in the boot configuration file (for example, freeway/boot/x25load)
- the executable object for the system-services module:
    - Freeway 1100 with ICP2424s (ISAbus boards): freeway/icpcode/icp2424/ osimpact/xio_2424.mem
    - Freeway 1100/1150/1200/1300 with ICP2432s (PCI boards): freeway/ icpcode/icp2432/osimpact/xio_2432.mem
    - Freeway 2000/4000/8800: freeway/icpcode/icp6000/osimpact/xio_6000. mem
- the executable object for the protocol software:
    - Freeway 1100 with ICP2424s (ISAbus boards): freeway/icpcode/ icp2424/protocols/x25_fw_2424.mem. (This file name must have been modified as described in Step 1 below to meet the MS-DOS file naming conventions.)
    - Freeway 1100/1150/1200/1300 with ICP2432s (PCI boards): freeway/icpcode/icp2432/ protocols/x25_fw_2432.mem. (This file name must have been modified as described in Step 1 below to meet the MS-DOS file naming conventions.)

    - Freeway 2000/4000/8800: freeway/icpcode/icp6000/protocols/x25_fw_6000.mem

- the system boot file:

    - Freeway 1100/1150/1200/1300: freeway/boot/fw486
    - Freeway 2000/4000/8800 with an MVME 162 CPU: freeway/boot/fw162
    - Freeway 2000/4000/8800 with an MVME 2600 CPU: freeway/boot/ fw2604

Step 1: Modify File Names to Meet MS-DOS Conventions (Freeway 1100/1150/1200/1300)

Because the Freeway 1100/1150/1200/1300 file name for the executable object for the protocol software (x25_fw_2424.mem or x25_fw_2432.mem) does not meet the MS-DOS file naming conventions, it must be modified. For example, x25_fw_2424.mem could be modified to x25_2424.mem. After changing the name of the x25_fw_2424.mem file, you must edit the download script file and replace x25_fw_2424.mem with the new name you have created.

If any other file that is to be copied to the hard drive does not meet the MS-DOS file naming conventions, you must rename it as well.

Step 2: Access the Freeway Interactive Menu

Log on to Freeway as described in Section 4.1.1 on page 118. You must be at the Freeway Interactive Menu.

Step 3: Modify the Freeway Boot Parameters to Boot from the Boot Server

The Boot Device, System Boot Directory, and Secondary Network Interface boot parameters differ depending on whether you are booting from a boot server or from a hard disk. Section 4.4.2.3 on page 129 describes how to display the boot parameters. Section 4.5.1

on page 148 describes how to modify the boot parameters. Any changes made to these parameters are stored in Freeway's non-volatile memory. Table 4–1 on page 150 describes each parameter.

Figure 4–41 shows the System Boot Parameters screen modified for booting from the boot server.

```
Freeway System Boot Parameters
------------------------------

Enter '.' to erase parameter
Enter '<RETURN>' for no parameter change


Boot Device                 :   elt,2
Processor Number            :   0
FTP User Name               :   freeway
FTP Password                :   password
Flags                       :   0
Freeway Server Name         :   freeway1
Freeway Inet Address        :   192.168.45.6
Freeway Subnet Mask         :   0xffff0000
Boot Server Name            :   bootmaster
Boot Server Inet Address    :   192.168.45.1
System Boot Directory       :   /usr/local/freeway/boot
System Boot File Name       :   fw486
Configuration File Name     :   bootcfg.pci
Secondary Net Interface     :
Gateway Inet Address        :

Save modifications?

Enter 'yes <RETURN>' to save modifications
Enter 'no <RETURN>' to prevent modifications:
```

Figure 4–41: Boot Parameters Modified to Boot from Boot Server

Step 4: Boot Freeway from the Boot Server

To verify that the boot parameters are correct, boot Freeway by selecting "Shutdown Options" at the Freeway Interactive Menu, then selecting "Reboot Server." Rebooting is described in Section 4.3.1 on page 122. If the boot fails, the hard disk cannot be built. When the boot process is successful, the login prompt appears.

Log in to the Freeway server with the default user name (simpact) and password (password). You can log in from the local console or use rlogin or telnet to log in from the boot server or any other computer on the network. The Freeway Interactive Menu is displayed.

You created a default configuration for the Freeway boot process when you performed the software installation procedures described in Chapter 2. The default configuration is sufficient for most sites. Customization is described in Chapter 3.

Step 5: Perform the "Build Hard Disk" Operation

After Freeway successfully boots from the boot server, you can build the hard disk. During this operation, the system copies the required files from the boot server to the hard disk.

Each hard disk file name must be unique. As distributed by Protogate, the full path names are defined so that uniqueness is ensured when the file names are created on the hard disk. If you change the file names, make sure this uniqueness is preserved.

To build the hard disk, the system:

1. Reads the Freeway boot parameters to determine the name of the system boot directory, the system boot file name, and the configuration file name.

2. Copies the boot configuration file from the boot server to the hard disk.

3. Opens the boot configuration file on the hard disk to determine the ICP device name and the name of the ICP download script file.

4. Copies the download script file (for example, freeway/boot/x25load) from the boot server to the hard disk.

5. Opens the download script file on the hard disk.

6. Copies the executable object for the system-services module from the boot server to the hard disk:

    - Freeway 1100 with ICP2424s (ISAbus boards): freeway/icpcode/icp2424/ osimpact/xio_2424.mem

    - Freeway 1100/1150/1200/1300 with ICP2432s (PCI boards): freeway/ icpcode/icp2432/ osimpact/xio_2432.mem

    - Freeway 2000/4000/8800: freeway/icpcode/icp6000/osimpact/xio_6000. mem

7. Copies the executable object for the protocol software from the boot server to the hard disk:

    - Freeway 1100 with ICP2424s (ISAbus boards): freeway/icpcode/icp2424/ protocols/x25_fw_2424.mem. (This file name must have been modified as describe in Step 1 on page 170 to meet the MS-DOS file naming conventions.)

    - Freeway 1100/1150/1200/1300 with ICP2432s (PCI boards): freeway/ icpcode/icp2432/protocols/x25_fw_2432.mem. (This file name must have been modified as described in Step 1 on page 170 to meet the MS-DOS file naming conventions.)

    - Freeway 2000/4000/8800s (VMEbus boards): freeway/icpcode/icp6000/ protocols/x25_fw_6000.mem

8. Repeats Step 4 through Step 7 for all download script files listed in the boot configuration file

9. Copies any modules identified in the boot configuration files with the sra_module parameter to the hard disk.

10. Copies the system boot file from the boot server to the hard disk:

    - Freeway 1100/1150/1200/1300: freeway/boot/fw486
    - Freeway 2000/4000/8800 with an MVME 162 CPU: freeway/boot/fw162
    - Freeway 2000/4000/8800 with an MVME 2600 CPU: freeway/boot/ fw2604

Step 6: Modify Boot Parameters to Boot from Hard Disk

The Boot Device, System Boot Directory, and Secondary Network Interface boot parameters differ depending on whether you are booting from a boot server or from a hard disk. Because you modified the boot parameters to enable Freeway to boot from the boot server in Step 3, you must now modify them to enable Freeway to boot from the hard disk.

Section 4.5.1 on page 148 describes how to modify the boot parameters. Any changes made to these parameters are stored in Freeway's non-volatile memory. Table 4–1 on page 150 describes each parameter.

Figure 4–42 shows the System Boot Parameters screen modified for booting from the hard disk.

Step 7: Boot Freeway from the Hard Disk

To boot Freeway, select "Shutdown Options" at the Freeway Interactive Menu, then select "Reboot Server." Rebooting is described in Section 4.3.1 on page 122. When the boot process is successful, the login prompt appears.

```
Freeway System Boot Parameters
------------------------------

Enter '.' to erase parameter
Enter '<RETURN>' for no parameter change


Boot Device                 :   ide=0,0
Processor Number            :   0
FTP User Name               :   freeway
FTP Password                :   password
Flags                       :   0
Freeway Server Name         :   freeway1
Freeway Inet Address        :   192.168.45.6
Freeway Subnet Mask         :   0xffff0000
Boot Server Name            :   bootmaster
Boot Server Inet Address    :   192.168.45.1
System Boot Directory       :   /ide/
System Boot File Name       :   fw486
Configuration File Name     :   bootcfg.pci
Secondary Net Interface     :   elt,2
Gateway Inet Address        :

Save modifications?

Enter 'yes <RETURN>' to save modifications
Enter 'no <RETURN>' to prevent modifications:
```

Figure 4–42: Boot Parameters Modified to Boot from Hard Disk

Log in to the Freeway server with the default user name (simpact) and password (password). You can log in from the local console, or use rlogin or telnet to log in from the boot server or any other computer on the network. The Freeway Interactive Menu is displayed.

The boot process includes reading the system boot file from the hard disk into server memory and transferring control to it. Then the boot configuration file is read from the hard disk into server memory. The content of the boot configuration file is used to read the ICP download script file from the hard disk into server memory. Each ICP download script file is examined and the executable objects for the system-services module and protocol software are read from the hard disk and written to ICP memory. At this point, Freeway is ready to perform its communication tasks.

4.7.2.3 Delete Hard Disk File

To delete a hard disk file as shown in Figure 4–43, enter '4' at the Hard Disk Maintenance Options menu. If you change your mind about deleting a file, simply press <return>, then you will be prompted to press <return> again.

Note

The Freeway 1100/1150/1200/1300 hard disk uses an MS-DOS file system. File names must follow the DOS convention of having a base name of no more than eight characters followed by a period and an extension of no more than three characters. File names for the Freeway 1100/1150/1200/1300 are not case sensitive.

Freeway 2000/4000/8800 uses the VxWorks DOS file system long name support feature. This feature allows the use of file names longer than MS-DOS's 8.3 convention. These names can be up to 40 characters long and can be made up of any ASCII characters. In addition, a period, which in MS-DOS indicates a file-name extension, has no special significance. File names for the Freeway 2000/4000/8800 are case sensitive.

The file names bootrom.sys and nvram.txt are reserved for Freeway 1100/1150/1200/1300 use and may not be deleted from the hard disk.

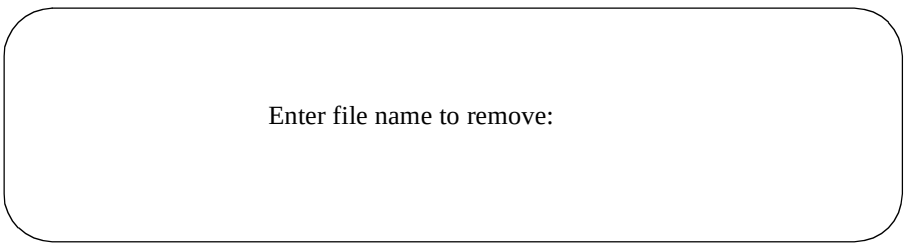

Figure 4–43: Delete Hard Disk File

4.7.2.4 Rename Hard Disk File

To rename a hard disk file as shown in Figure 4–44, enter '5' at the Hard Disk Maintenance Options menu. If you change your mind about renaming a file, simply press <return>, then you will be prompted to press <return> again.

Keep these points in mind regarding file names on a Freeway hard disk:

- The Freeway 1100/1150/1200/1300 hard disk uses an MS-DOS file system. File names must follow the DOS convention of having a base name of no more than eight characters followed by a period and an extension of no more than three characters. File names for the Freeway 1100/1150/1200/1300 are not case sensitive.
- Freeway 2000/4000/8800 uses the VxWorks DOS file system long name support feature. This feature allows the use of file names longer than MS-DOS's 8.3 convention. These names can be up to 40 characters long and can be made up of any ASCII characters. In addition, a period, which in MS-DOS indicates a file-name extension, has no special significance. File names for the Freeway 2000/4000/8800 are case sensitive.
- The file names bootrom.sys and nvram.txt are reserved for Freeway 1100/1150/1200/1300 use and may not be renamed.
- Each hard disk file name must be unique. As distributed by Protogate, the full path names are defined so that uniqueness is ensured when the file names are created on the hard disk. If you change the file names, make sure this uniqueness is preserved.

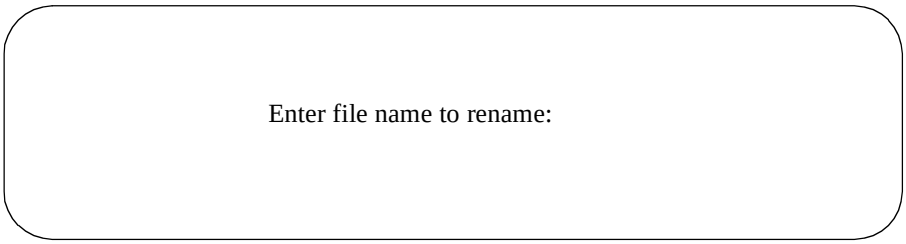

Figure 4–44: Rename Hard Disk File

4.7.3 Floppy Disk Copy Options

To access the Floppy Disk Copy Options menu as shown in Figure 4–45, enter ‘4’ at the Disk Drive Options menu.

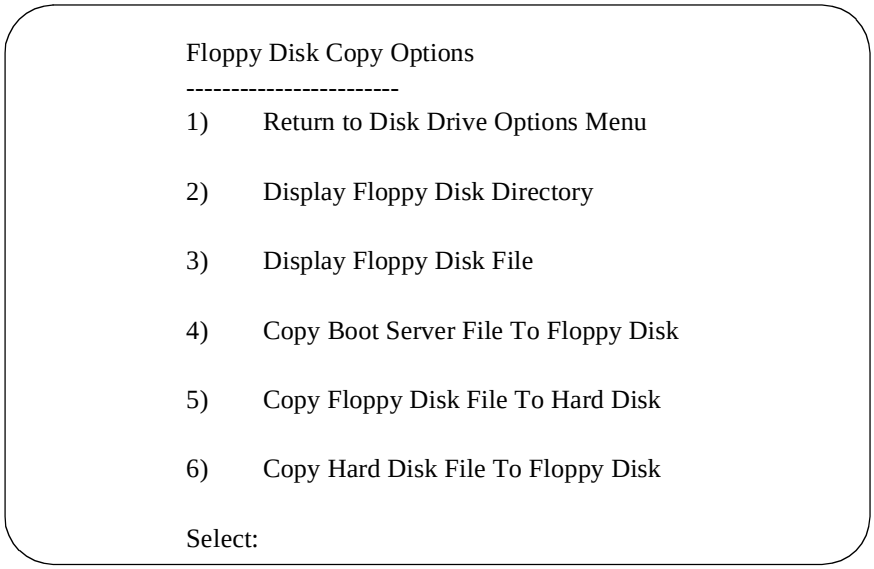

Figure 4–45: Floppy Disk Copy Options Menu

4.7.3.1 Display Floppy Disk Directory

To display the floppy disk directory as shown in Figure 4–46, enter ‘2’ at the Floppy Disk Copy Options menu.

Note

File names for the Freeway 2000/4000/8800 are case sensitive.

```
Display Disk Devices
--------------------
ID LUN VendorID    ProductID     Rev. Type  Blocks  BlkSize pScsiPhysDev
-- --- -------- ---------------- ---- ---- -------- ------- ------------
 2  0  TEAC     FC-1     HF   11 RV J   0R    2880    512    0x00792144
 6  0  MAXTOR   7245-SCSI       1761   0   479656    512    0x00790e50

Directory /fd
-------------
  size         date       time       name
--------      ------     ------    --------
  345534    APR-15-1997 11:57:12   BOOTROM.SYS
    4096    APR-15-1997 12:00:10   NVRAM.TST

   Press RETURN to continue
```

Figure 4–46: Display Floppy Disk Directory

4.7.3.2 Display Floppy Disk File

To display a floppy disk file as shown in Figure 4–47, enter ‘3’ at the Floppy Disk Copy Options menu. If you change your mind about displaying a file, simply press <return>, then you will be prompted to press <return> again.

Note

File names for the Freeway 2000/4000/8800 are case sensitive.

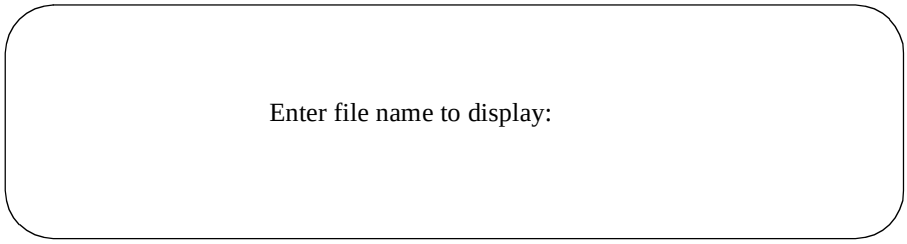

Figure 4–47: Display Floppy Disk File

4.7.3.3 Copy Boot Server File to Floppy Disk

To copy a boot server file to the floppy disk as shown in Figure 4–48, enter '4' at the Floppy Disk Copy Options menu. If you change your mind about copying a file, simply press <return>, then you will be prompted to press <return> again.

Note

The Freeway 1100/1150/1200/1300 hard disk uses an MS-DOS file system. File names must follow the DOS convention of having a base name of no more than eight characters followed by a period and an extension of no more than three characters. File names for the Freeway 1100/1150/1200/1300 are not case sensitive.

Freeway 2000/4000/8800 uses the VxWorks DOS file system long name support feature. This feature allows the use of file names longer than MS-DOS's 8.3 convention. These names can be up to 40 characters long and can be made up of any ASCII characters. In addition, a period, which in MS-DOS indicates a file-name extension, has no special significance. File names for the Freeway 2000/4000/8800 are case sensitive.

The file names bootrom.sys and nvram.txt are reserved for Freeway 1100/1150/1200/1300 use and may not be copied to or from any disk.

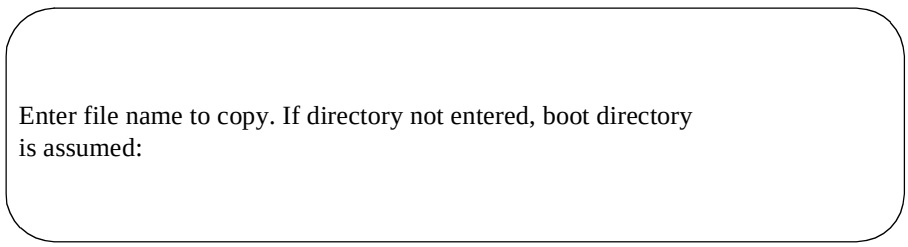

Figure 4–48: Copy Boot Server File to Floppy Disk

4.7.3.4 Copy Floppy Disk File to Hard Disk

To copy a floppy disk file to the hard disk as shown in Figure 4–49, enter '5' at the Floppy Disk Copy Options menu. If you change your mind about copying a file, simply press <return>, then you will be prompted to press <return> again.

Note

The Freeway 1100/1150/1200/1300 hard disk uses an MS-DOS file system. File names must follow the DOS convention of having a base name of no more than eight characters followed by a period and an extension of no more than three characters. File names for the Freeway 1100/1150/1200/1300 are not case sensitive.

Freeway 2000/4000/8800 uses the VxWorks DOS file system long name support feature. This feature allows the use of file names longer than MS-DOS's 8.3 convention. These names can be up to 40 characters long and can be made up of any ASCII characters. In addition, a period, which in MS-DOS indicates a file-name extension, has no special significance. File names for the Freeway 2000/4000/8800 are case sensitive.

The file names bootrom.sys and nvram.txt are reserved for Freeway 1100/1150/1200/1300 use and may not be copied to or from any disk. If either of these file names is on the floppy disk, using * to copy all files will result in an error when Freeway attempts to copy the reserved file.

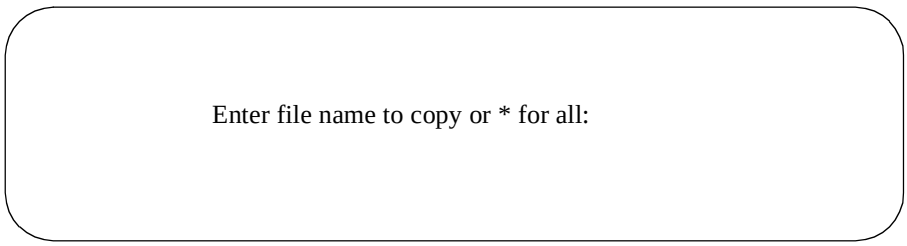

Figure 4–49: Copy Floppy Disk File to Hard Disk

4.7.3.5 Copy Hard Disk File to Floppy Disk

To copy a hard disk file to the floppy disk as shown in Figure 4–50, enter '6' at the Floppy Disk Copy Options menu. If you change your mind about copying a file, simply press <return>, then you will be prompted to press <return> again.

Note

The Freeway 1100/1150/1200/1300 hard disk uses an MS-DOS file system. File names must follow the DOS convention of having a base name of no more than eight characters followed by a period and an extension of no more than three characters. File names for the Freeway 1100/1150/1200/1300 are not case sensitive.

Freeway 2000/4000/8800 uses the VxWorks DOS file system long name support feature. This feature allows the use of file names longer than MS-DOS's 8.3 convention. These names can be up to 40 characters long and can be made up of any ASCII characters. In addition, a period, which in MS-DOS indicates a file-name extension, has no special significance. File names for the Freeway 2000/4000/8800 are case sensitive.

The file names bootrom.sys and nvram.txt are reserved for Freeway 1100/1150/1200/1300 use and may not be copied to or from any disk. If either of these file names is on the hard disk, using * to copy all files will result in an error when Freeway attempts to copy the reserved file.

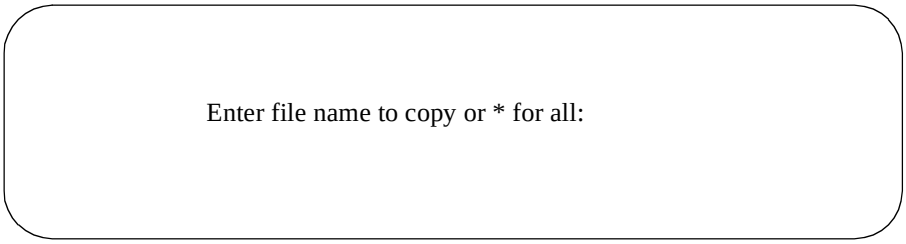

Figure 4–50: Copy Hard Disk File to Floppy Disk

4.7.4 Floppy Disk Maintenance Options

To access the Floppy Disk Maintenance Options menu as shown in Figure 4–51, enter '5' at the Disk Drive Options menu.

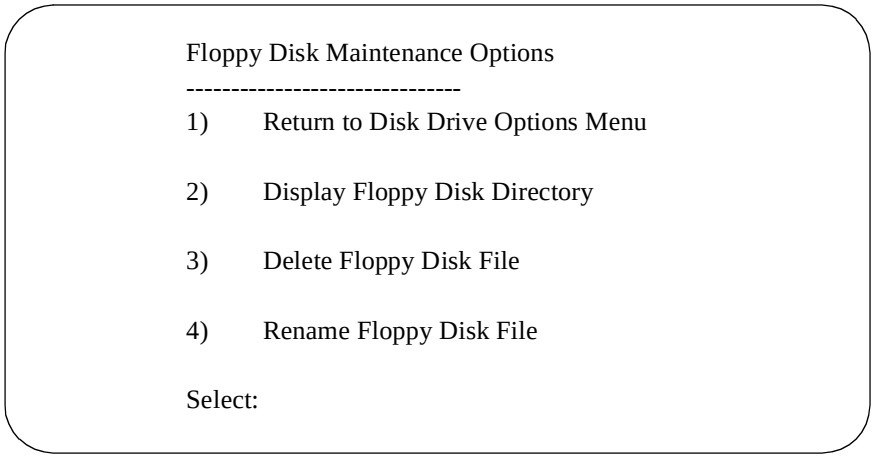

Figure 4–51: Floppy Disk Maintenance Options Menu

4.7.4.1 Display Floppy Disk Directory

To display the floppy disk directory as shown in Figure 4–52, enter '2' at the Floppy Disk Maintenance Options menu.

Note

File names for the Freeway 2000/4000/8800 are case sensitive.

```
Display Disk Devices
--------------------
ID LUN VendorID    ProductID     Rev. Type  Blocks  BlkSize pScsiPhysDev
-- --- -------- ---------------- ---- ---- -------- ------- ------------
 2  0  TEAC     FC-1     HF   11 RV J   0R    2880    512    0x00792144
 6  0  MAXTOR   7245-SCSI       1761   0   479656    512    0x00790e50

Directory /fd
-------------
  size         date       time       name
--------      ------     ------    --------
  345534    APR-15-1997 11:57:12   BOOTROM.SYS
    4096    APR-15-1997 12:00:10   NVRAM.TST

   Press RETURN to continue
```

Figure 4–52: Display Floppy Disk Directory

4.7.4.2 Delete Floppy Disk File

To delete a floppy disk file as shown in Figure 4–53, enter '3' at the Floppy Disk Maintenance Options menu. If you change your mind about deleting a file, simply press <return>, then you will be prompted to press <return> again.

Note

The Freeway floppy disk uses an MS-DOS file system. File names must follow the DOS convention of having a base name of no more than eight characters followed by a period and an extension of no more than three characters. File names for the Freeway 1100/1150/1200/1300 are not case sensitive.

The file names bootrom.sys and nvram.txt are reserved for Freeway 1100/1150/1200/1300 use and may not be deleted from the floppy disk.

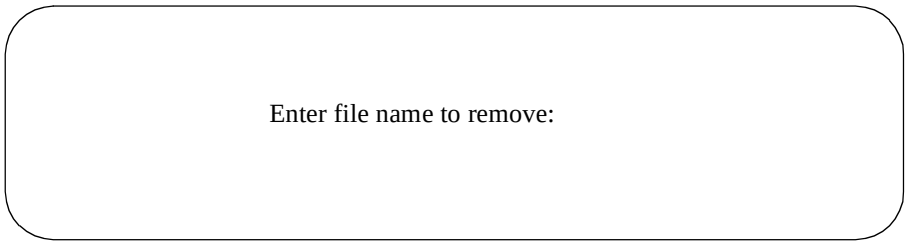

Figure 4–53: Delete Floppy Disk File

4.7.4.3 Rename Floppy Disk File

To rename a floppy disk file as shown in Figure 4–54, enter '4' at the Floppy Disk Maintenance Options menu. If you change your mind about renaming a file, simply press <return>, then you will be prompted to press <return> again.

Note

The Freeway floppy disk uses an MS-DOS file system. File names must follow the DOS convention of having a base name of no more than eight characters followed by a period and an extension of no more than three characters. File names for the Freeway 1100/1150/1200/1300 are not case sensitive.

The file names bootrom.sys and nvram.txt are reserved for Freeway 1100/1150/1200/1300 use and may not be renamed.

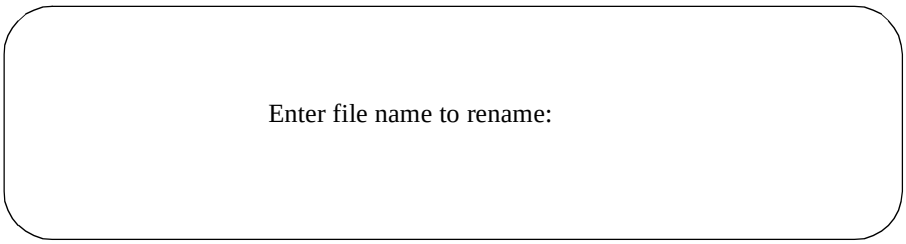

Figure 4–54: Rename Floppy Disk File

4.8 Run VxWorks Shell

To access the VxWorks shell as shown in Figure 4–55, enter ‘6’ at the Freeway Interactive Menu. The VxWorks shell allows you to interactively invoke any subroutine that has been loaded into Freeway’s memory, including those supplied by the VxWorks operating system, those supplied by Protogate, and those defined in any of your own application modules that have been loaded using the sra_module parameter in the boot configuration file (Section 3.2 on page 100) or via the shell. Upon the first invocation of the shell, the symbol table for the Freeway server (fw*yyy*.sym[1]) is loaded from the System Boot Directory to resolve all function references called from the shell, unless it has already been loaded to resolve references in modules loaded with the sra_module parameter. Because use of the VxWorks shell requires at least a working knowledge of the VxWorks operating system and provides a powerful interface that could cause the Freeway to crash if used improperly, it is recommended that the vxworks_shell parameter in the boot configuration file be set to FALSE after development of your customized application modules is complete to prevent access to the VxWorks shell. To exit the shell, type “exit” at the shell prompt and hit return twice.

Note

This option is only displayed if the vxworks_shell parameter is set to TRUE in your boot configuration file when Freeway is booted. See Section 3.2 on page 100.

1. *yyy* = 486 for Freeway 1100/1150/1200/1300, 162 for a Freeway 2000/4000/8800 with an MVME 162 CPU, or 2604 for a Freeway 2000/4000/8800 with an MVME 2600 CPU.

```
Loading symbol table from scribe:/rose/ron/2/freeway/boot/fw486.sym ...done
0x382fbc (int_act): STATUS:  Spawning VxWorks Shell


 ]]]
```

4.9 Example SRA Menu

To access the Example SRA Menu as shown in Figure 4–56, enter ‘7’ at the Freeway Interactive Menu.

Note

This option is only displayed if the example SRA is loaded and run using the sra_module and sra_entry parameters in the boot configuration file. See the *Freeway Server-Resident Application and Server Toolkit Programmer Guide* for information on modifying this menu option.

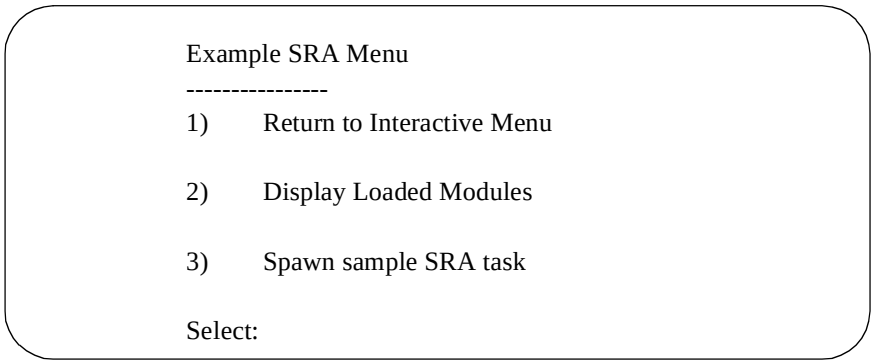

Figure 4–56: Trace Functions Menu

4.9.1 Display Loaded Modules

To display the object modules that have been loaded onto Freeway as shown in Figure 4–57, enter '2' at the Example SRA Menu. See the *Freeway Server-Resident Application and Server Toolkit Programmer Guide* for information on modifying the Example SRA Menu options.

```
MODULE NAME     MODULE ID  GROUP #    TEXT START DATA START  BSS
START
--------------- ---------- ---------- ---------- ---------- ----------
     sra486.o   0x7644c0         2   0x75a0bc   0x75e35c   0x75e4a4


  Press RETURN to continue
```

Figure 4–57: Display Loaded Modules

4.9.2 Spawn Example SRA task

To spawn the example SRA task (sraalp), enter '3' at the Example SRA Menu and enter the number of minutes for the task to run as shown in Figure 4–58. A three-headed loopback cable must be installed between links 0 and 1 of ICP 0 and a synchronous modem before this option is selected. The example SRA task is a loopback test which opens two DLI sessions and enables two links, then transfers data on both links. The test continues for the number of minutes indicated, then the number of messages sent and received on each link are printed on the Freeway console. Links are then disabled and the sessions are closed. Note that if this option is chosen from an rlogin or telnet session, the log messages will be displayed to the Freeway console, not to the rlogin or telnet session. Only the message "Task 'sraalp' spawned. (X minutes)." will be printed to the rlogin or telnet session. If you are using the Interactive Menus on the Freeway console while the example SRA task is running, the task's log messages will be interspersed with the messages from your Interactive Menus. See the *Freeway Server-Resident Application and Server Toolkit Programmer Guide* for information on modifying the Example SRA Menu options.

```
Enter number of minutes to run (1 - 60): 1

Task "sraalp" spawned. (1 minutes).


Press RETURN to continue0x591bdc (sraalp): 981203_111057: STATUS: Open_Sess: Session 0
opened to msgmux.
0x591bdc (sraalp): 981203_111057: STATUS: Open_Sess: Session 1 opened to msgmux.
0x591bdc (sraalp): 981203_111058: STATUS: Attach: Session 0 attached to ICP.
0x591bdc (sraalp): 981203_111059: STATUS: Attach: Session 1 attached to ICP.
0x591bdc (sraalp): 981203_111100: STATUS: Config: Session 0 link configured.
0x591bdc (sraalp): 981203_111101: STATUS: Config: Session 1 link configured.
0x591bdc (sraalp): 981203_111102: STATUS: Enable: Session 0 link enabled
0x591bdc (sraalp): 981203_111103: STATUS: Enable: Session 1 link enabled
0x591bdc (sraalp): 981203_111103: STATUS: Xfer_Data: Using 512-byte data transfers.
0x591bdc (sraalp): 981203_111103: STATUS: Xfer_Data: Loopback test in progress (60 seconds).
0x591bdc (sraalp): 981203_111203: STATUS: Xfer_Data: Waiting for steady state.
0x591bdc (sraalp): 981203_111205: STATUS: Xfer_Data: Session 0 sent 92 blocks, rcvd 92.
0x591bdc (sraalp): 981203_111205: STATUS: Xfer_Data: Session 1 sent 92 blocks, rcvd 92.
0x591bdc (sraalp): 981203_111206: STATUS: Disable: Session 0 link disabled.
0x591bdc (sraalp): 981203_111207: STATUS: Disable: Session 1 link disabled.
0x591bdc (sraalp): 981203_111208: STATUS: Detach: Session 0 detached from ICP.
0x591bdc (sraalp): 981203_111209: STATUS: Detach: Session 1 detached from ICP.
0x591bdc (sraalp): 981203_111210: STATUS: Cleanup: Session 0 closed.
0x591bdc (sraalp): 981203_111210: STATUS: Cleanup: Session 1 closed.
0x591bdc (sraalp): 981203_111212: STATUS: sraalp: Program completed successfully.
```

Figure 4–58: Example SRA Task Display

4.10 Logout

To logout of your Freeway session, select the Logout option in the Freeway Interactive Menu. If you logout from a local console, you return to the Freeway User Login prompt. If you logout from an rlogin or telnet session, you return to your system prompt.

Appendix

A Installation at a Glance

After you are familiar with the detailed software installation procedures described in Chapter 2, you can use one of the following summaries as a quick reference for a default installation. Section A.1 describes a UNIX installation, Section A.2 describes a VMS installations, and Section A.3 describes a Windows NT installation. If you need more information on any of the summary steps, see the page number reference shown in *italics*.

Note

These procedures assume that your computer is configured as a boot server, described in Section 2.1 on page 32. This allows you to perform all operations from this computer.

A.1 UNIX Installations

Step 1: Install the Freeway software *Chapter 2*

> **Note**
>
> Remember that the *ppp* variable indicates the particular protocol or toolkit you are using (refer to Table 2–2 on page 31).

a. Log in to a root or other privileged account. *page 43*

b. **cd /usr/local** *page 43*

c. Insert the distribution media into the appropriate drive. *page 44*

d. Copy the software onto your computer. *page 45*

Step 2: Edit the boot configuration file (**bootcfg.*xxx***[1]) *page 46*

cd /usr/local/freeway/boot

For a Freeway 1100 with both ICP2424 and ICP2432 boards installed, merge the bootcfg.isa and bootcfg.pci files to form a new configuration file.

a. Uncomment the physical parameters associated with each ICP in your Freeway.

b. For all Freeways, modify the slave_address entry of each ICP to match your configuration.

c. For Freeway 1100/1150/1200/1300, modify the bus_number entry of each ICP to match your configuration.

1. Freeway 1100 uses bootcfg.isa (ICP2424) or bootcfg.pci (ICP2432). Freeway 1150/1200/1300 uses bootcfg.pci. Freeway 2000/4000/8800 uses bootcfg.vme. Any Freeway using ICP_IP virtual ICP devices may use bootcfg.ip.

d. Modify the name of the load file in each download_script entry.

e. If you have moved the load file from the boot directory, enter the path name for the load file in each download_script entry.

f. If you will be using the SRA, uncomment the lines sra_module = sra*xxx*.o[1] and sra_entry = sraInit to load and run the example SRA software at boot time. Also modify the tsi_config_file parameter to use the muxcfg.sra file.

g. For ICP_IP virtual devices, modify the bootcfg.ip file to reflect your network configuration as described in Section 3.2.1 on page 108.

Step 3: Edit the load file (***ppp*load**) *page 47*

a. Uncomment the lines associated with the type of ICP in your Freeway.

b. Modify path names as needed.

c. Do not change the memory locations (such as 40001200) for the LOAD commands.

Step 4: Build the DLI and TSI files *page 48*

a. If necessary, create the *op-sys* directory: dec, hpux, sgi, solaris, or sunos:

cd /usr/local/freeway/client
mkdir *op-sys*

b. From your *op-sys* directory, create the bin and lib directories:

cd *op-sys*
mkdir bin
mkdir lib

1. *xxx* = 486 for a Freeway1100/1150/1200/1300, 68K for a Freeway 2000/4000/8800 with an MVME 162 CPU, or ppc for a Freeway 2000/4000/8800 with an MVME 2600 CPU.

c. Run the make file:

cd /usr/local/freeway/lib
make -f Makefile.op-sys all

The *op-sys* variable indicates the operating system: DEC, HPUX, SGI, SOL, or SUN. The newly created files will be placed in the proper freeway/client/*op-sys*/bin or freeway/client/*op-sys*/lib directory.

Step 5: Build the CS API library file (X.25 only) *page 49*

a. Run the make file:

cd /usr/local/freeway/lib/cs_api
make -f makefile.*op-sys* all

The *op-sys* variable indicates the operating system: dec, hpux, sgi, sol, or sun. The newly created file will be placed in the freeway/client/*op-sys*/lib directory.

Step 6: Compile the example SRA *page 50*

a. If it doesn't already exist, create the freeway/server/vw directory.

cd /usr/local/freeway/server
mkdir vw

b. If you did not install the server software in /usr/local, modify the path assigned to FWBASE in the freeway/envcom file.

c. If you did not install the Tornado software in /usr/wind, modify the path assigned to WIND_BASE in the freeway/[env486, env68k, or envppc] file.

d. If you will be using a GNU compiler that is not part of a Tornado distribution, see the *Freeway Server-Resident Application and Server Toolkit Programmer Guide*.

e. Run the make file:

cd /usr/local/freeway

For a Freeway 1100/1150/1200/1300:

/usr/wind/host/sun4-sunos4/bin/make -f MakeSRA.I486 clean all

For a Freeway 2000/4000/8800 with an MVME 162 CPU:

/usr/wind/host/sun4-sunos4/bin/make -f MakeSRA.68K clean all

For a Freeway 2000/4000/8800 with an MVME 2600 CPU:

/usr/wind/host/sun4-sunos4/bin/make -f MakeSRA.ppc clean all

This compiles all the necessary source code and links the object files to form the SRA object module, which is then placed in the freeway/boot directory.

f. Because the example SRA runs the loopback test automatically when Freeway is booted, install a three-headed loopback cable between links 0 and 1 of ICP 0 and a synchronous modem before continuing to Step 9 on page 203.

Step 7: Compile the Server Toolkit *page 52*

To build a customized Freeway image using the optional Server Toolkit product, you must have purchased and installed Tornado from Wind River Systems with the appropriate Board Support Package for your Freeway.

a. Edit freeway/envcom. If you installed the server toolkit software in a directory other than /usr/local, modify the path assigned to FWBASE in the freeway/envcom file.

b. Edit freeway/[env486, env68k, or envppc]. If you installed Tornado in a directory other than /usr/wind, modify the path assigned to WIND_BASE in the freeway/env486 file (Freeway 1100/1150/1200/1300), freeway/env68k file

(Freeway 2000/4000/8800 with an MVME 162 CPU) or freeway/envppc file (Freeway 2000/4000/8800 with an MVME 2600 CPU).

c. Run the make file.

For Freeway 1100/1150/1200/1300:
/usr/wind/host/sun4-solaris2/bin/make -f MakeSTK.I486 clean all

For a Freeway 2000/4000/8800 with an MVME 162 CPU:
/usr/wind/host/sun4-solaris2/bin/make -f MakeSTK.68K clean all

For a Freeway 2000/4000/8800 with an MVME 2600 CPU:
/usr/wind/host/sun4-solaris2/bin/make -f MakeSTK.ppc clean all

Step 8: Build the loopback tests (except the example SRA) *page 53*

cd /usr/local/freeway/client/test/*ppp*

a. Edit the client TSI configuration file (*ppp*altcfg[1]), changing the default value of the Freeway server parameter, freeway_0, to the name (or Internet address) of your current Freeway server.

b. If you are using AWS, BSC, or FMP on a Freeway 1100/1150/1200/1300, edit the DLI configuration file (*ppp*aldcfg), setting the ElecInterface parameter to the correct electrical interface.

c. Run the make file:

make -f makefile.op-sys all

The *op-sys* variable indicates the operating system: dec, hpux, sgi, sol, or sun. The newly created files will be placed in the freeway/client/*op-sys*/bin directory.

1. The Military/Government protocol uses miltcfg. X.25 uses apitcfg.

Step 9: Modify the Freeway system boot parameters *page 93*

If you did not install the software in /usr/local, modify the path name for the System Boot Directory. Log in to Freeway. From the Freeway Interactive Menu, select "Modify Configuration," then select "Modify Boot Parameters."

Step 10: Boot Freeway to download the software *page 94*

To boot Freeway from the Freeway Interactive Menu, select "Shutdown Options," then select "Reboot Server."

Step 11: Run the loopback test *Freeway Loopback Test Procedures*

Refer to the *Freeway Loopback Test Procedures* to run the loopback test program for your protocol.

A.2 VMS Installations

Step 1: Install the Freeway software *Chapter 2*

> **Note**
>
> Remember that the *ppp* variable indicates the particular protocol or toolkit you are using (refer to Table 2–2 on page 31).

a. Log in to an account that has system-manager privileges. *page 61*

b. **SET DEF SYS$SYSDEVICE** *page 61*

c. Insert the distribution media into the appropriate drive. *page 61*

d. Copy the software onto your computer. *page 61*

@SYS$UPDATE:VMSINSTAL

Step 2: Edit the boot configuration file (**BOOTCFG.*xxx***[1]) *page 66*

SET DEF SYS$SYSDEVICE:[FREEWAY.BOOT]

For a Freeway 1100 with both ICP2424 and ICP2432 boards installed, merge the bootcfg.isa and bootcfg.pci files to form a new configuration file.

a. Uncomment the physical parameters associated with each ICP in your Freeway.

b. For Freeway 2000/4000/8800, modify the slave_address entry of each ICP to match your configuration.

c. Modify the name of the load file in each download_script entry.

1. Freeway 1100 uses BOOTCFG.ISA (ICP2424) or BOOTCFG.PCI (ICP2432). Freeway 1150/1200/1300 uses BOOTCFG.PCI. Freeway 2000/4000/8800 uses BOOTCFG.VME. Any Freeway using ICP_IP virtual ICP devices may use BOOTCFG.IP.

d. If you have moved the load file from the BOOT directory, enter the path name for the load file in each download_script entry.

e. For ICP_IP virtual devices, modify the BOOTCFG.IP file to reflect your network configuration as described in Section 3.2.1 on page 108.

Step 3: Edit the load file (***ppp*LOAD**) *page 68*

a. Uncomment the lines associated with the type of ICP in your Freeway.

b. Modify path names as needed.

c. Do not change the memory locations (such as 40001200) for the LOAD commands.

Step 4: Build the DLI and TSI files *page 69*

a. If necessary, create the *OP-SYS* directory: AXP_MULTINET, AXP_TCPWARE, or AXP_UCX:

SET DEF SYS$SYSDEVICE:[FREEWAY.CLIENT]
CREATE /DIR *OP-SYS*

b. From your *OP-SYS* directory, create the BIN and LIB directories:

SET DEF *OP-SYS*
CREATE /DIR BIN
CREATE /DIR LIB

c. Run the MAKE_DLI_TSI command:

SET DEF SYS$SYSDEVICE[FREEWAY.LIB]
@MAKE_DLI_TSI "" [MULTINET, **TCPWARE**, or **UCX]**

The newly created files will be placed in the proper FREEWAY.CLIENT.*OP-SYS*.BIN or FREEWAY.CLIENT.*OP-SYS*.LIB directory.

Step 5: Build the CS API library file (X.25 only) *page 70*

a. Run the MAKEVMS command:

SET DEF SYS$SYSDEVICE[FREEWAY.LIB.CS_API]
@MAKEVMS "" [MULTINET, **TCPWARE**, or **UCX]**

The newly created file will be placed in the FREEWAY.CLIENT.*OP-SYS*.LIB directory.

Step 6: Build QIO/SQIO API library file *page 71*

a. Run the MAKEVMS file:

SET DEF SYS$SYSDEVICE[FREEWAY.LIB.QAPI]
@MAKEVMS "" [MULTINET, **TCPWARE**, or **UCX]**

The newly created file will be placed in the FREEWAY.CLIENT.*OP-SYS*.LIB directory.

Step 7: Build the loopback tests *page 71*

SET DEF FREEWAY.CLIENT.TEST.*ppp*

a. Edit the client TSI configuration file (*ppp*ALTCFG[1]), changing the default value of the Freeway server parameter, freeway_0, to the name (or Internet address) of your current Freeway server.

b. If you are using AWS, BSC, or FMP on a Freeway 1100/1150/1200/1300, edit the DLI configuration file (*ppp*ALDCFG), setting the ElecInterface parameter to the correct electrical interface.

1. The Military/Government protocol uses MILTCFG. X.25 uses APITCFG.

c. Run the MAKEVMS command:

@MAKEVMS "" [MULTINET, **TCPWARE**, or **UCX]**

The newly created files will be placed in the FREEWAY.CLIENT.*OP-SYS*.BIN directory.

Step 8: Modify the Freeway system boot parameters *page 93*

Modify the path name for the System Boot Directory. Log in to Freeway. From the Freeway Interactive Menu, select "Modify Configuration," then select "Modify Boot Parameters."

Step 9: Boot Freeway to download the software *page 94*

To boot Freeway from the Freeway Interactive Menu, select "Shutdown Options," then select "Reboot Server."

Step 10: Run the loopback test *Freeway Loopback Test Procedures*

Refer to the *Freeway Loopback Test Procedures* to run the loopback test program for your protocol.

A.3 Windows NT Installations

Step 1: Install the Freeway software *Chapter 2*

> **Note**
>
> Remember that the *ppp* variable indicates the particular protocol or toolkit you are using (refer to Table 2–2 on page 31).

a. Log in to a privileged account. *page 81*

b. Insert the diskette in the appropriate drive. *page 81*

c. Copy the software onto your computer. *page 81*

Step 2: Edit the boot configuration file (**bootcfg.*xxx***[1]) *page 82*

cd C:\freeway\boot

For a Freeway 1100 with both ICP2424 and ICP2432 boards installed, merge the bootcfg.isa and bootcfg.pci files to form a new configuration file.

a. Uncomment the physical parameters associated with each ICP in your Freeway.

b. For Freeway 2000/4000/8800, modify the slave_address entry of each ICP to match your configuration.

c. Modify the name of the load file in each download_script entry.

d. If you have moved the load file from the boot directory, enter the path name for the load file in each download_script entry.

1. Freeway 1100 uses bootcfg.isa (ICP2424) or bootcfg.pci (ICP2432). Freeway 1150/1200/1300 uses bootcfg.pci. Freeway 2000/4000/8800 uses bootcfg.vme. Any Freeway using ICP_IP virtual ICP devices may use bootcfg.ip.

e. If you will be using the SRA, uncomment the lines sra_module = sra*xxx*.o[1] and sra_entry = sraInit to load and run the example SRA software at boot time. Also modify the tsi_config_file parameter to use the muxcfg.sra file.

f. For ICP_IP virtual devices, modify the bootcfg.ip file to reflect your network configuration as described in Section 3.2.1 on page 108.

Step 3: Edit the load file (***ppp*load**) *page 83*

a. Uncomment the lines associated with the type of ICP in your Freeway.

b. Modify path names as needed.

c. Do not change the memory locations (such as 40001200) for the LOAD commands.

Step 4: Build the DLI and TSI files *page 84*

a. If necessary, create the *op-sys* directory: axp_nt or int_nt:

cd C:\freeway\client
mkdir *op-sys*

b. From your *op-sys* directory, create the bin and lib directories:

cd *op-sys*
mkdir bin
mkdir lib

c. Run the make file:

cd C:\freeway\lib
make_ant (for an Alpha NT system)
make_int (for an Intel NT system)

1. *xxx* = 486 for a Freeway1100/1150/1200/1300, 68K for a Freeway 2000/4000/8800 with an MVME 162 CPU, or ppc for a Freeway 2000/4000/8800 with an MVME 2600 CPU.

The newly created files will be placed in the proper freeway\client\ *op-sys*\bin or freeway\client*op-sys*\lib directory.

d. Modify the dynamic link libraries to reside in the current working directory or in a directory specified in your "PATH" environment variable.

Add C:\freeway\client*op-sys*\lib to your path.

or

Copy the .dll files from C:\freeway\client*op-sys*\lib to your bin directory or to another directory in your path.

Step 5: Build CS API library file (X.25 only) *page 86*

a. Run the make file:

cd C:\freeway\lib\cs_api	
nmake -f makefile.ant	(for an Alpha NT system)
nmake -f makefile.int	(for an Intel NT system)

The newly created file will be placed in the freeway\client*op-sys*\lib directory.

Step 6: Compile the example SRA *page 87*

a. Modify the path assigned to FWBASE in the freeway\envcom file.

b. If you are using the GNU tool set distributed with Tornado to compile your SRA, create a custom build project using the Tornado development environment. Launch the Tornado development environment, then from the menu bar select Project, Customize..., then Add.... Enter one of the following for the name of the build target:

   For a Freeway 1100/1150/1200/1300:

   -f MakeSRA.I486 clean all

   For a Freeway 2000/4000/8800 with an MVME 162 CPU:

   -f MakeSRA.68K clean all

   For a Freeway 2000/4000/8800 with an MVME 2600 CPU:

   -f MakeSRA.ppc clean all

   This compiles all the necessary source code and links the object files to form the SRA object module, which is then placed in the freeway\boot directory.

c. Enter the path of your Freeway installation directory (for example, C:\freeway) for the working directory of the customized build just created.

d. When you are finished creating the custom project, perform the build by selecting Project from the Tornado menu bar, then selecting the name of the build target you've created. Tornado will make the SRA object module and place it in the freeway\boot directory.

e. Because the example SRA runs the loopback test automatically when Freeway is booted, install a three-headed loopback cable between links 0 and 1 of ICP 0 and a synchronous modem before continuing to Step 9 on page 213.

Step 7: Compile the Server Toolkit *page 89*

To build a customized Freeway image using the optional Server Toolkit product, you must have purchased and installed Tornado from Wind River Systems with the appropriate Board Support Package for your Freeway.

a. Edit freeway\envcom. Modify the path assigned to FWBASE in the freeway\envcom file to match your Freeway installation directory.

b. Launch the Tornado development environment, then from the menu bar select Project, Customize…, then Add…. Enter one of the following for the name of the build target:

   For a Freeway 1100/1150/1200/1300:

   -f MakeSRA.I486 clean all

   For a Freeway 2000/4000/8800 with an MVME 162 CPU:

   -f MakeSRA.68K clean all

   For a Freeway 2000/4000/8800 with an MVME 2600 CPU:

   -f MakeSRA.ppc clean all

   Enter the path of your Freeway installation directory (for example, C:\freeway) for the working directory of the customized build just created.

c. When you are finished creating the custom project, perform the build by selecting Project from the Tornado menu bar, then selecting the name of the build target you've created.

   Tornado will build the Freeway server image, VxWorks image, and loadable Freeway server module for the specified Freeway architecture and place them in the freeway\boot directory.

Step 8: Build the loopback tests (except the example SRA) *page 90*

cd C:\freeway\client\test*ppp*

a. Edit the client TSI configuration file (*ppp*altcfg[1]), changing the default value of the Freeway server parameter, freeway_0, to the name (or Internet address) of your current Freeway server.

b. If you are using AWS, BSC, or FMP on a Freeway 1100/1150/1200/1300, edit the DLI configuration file (*ppp*aldcfg), setting the ElecInterface parameter to the correct electrical interface.

c. Run the make file:

nmake -f makefile.ant all	(for an Alpha NT system)
nmake -f makefile.int all	(for an Intel NT system)

The newly created files will be placed in the freeway\client*op-sys*\bin directory.

Step 9: Modify the Freeway system boot parameters *page 93*

Modify the path name for the System Boot Directory. Log in to Freeway. From the Freeway Interactive Menu, select "Modify Configuration," then select "Modify Boot Parameters."

Step 10: Boot Freeway to download the software *page 94*

To boot Freeway from the Freeway Interactive Menu, select "Shutdown Options," then select "Reboot Server."

1. The Military/Government protocol uses miltcfg. X.25 uses apitcfg.

Step 11: Run the loopback test *Freeway Loopback Test Procedures*

Refer to the *Freeway Loopback Test Procedures* to run the loopback test program for your protocol.

Appendix

B Freeway Files

B.1 Default Directory Structure

After you have installed the Freeway files as described in Chapter 2, the files reside in a default directory structure. The freeway/include directory contains the header files your protocol needs to interface with the DLI and TSI layers. The other directories are grouped into three areas according to the types of files they contain: client-resident, server-resident, or ICP-resident software. This software is described in the following sections.

On UNIX systems, all default directories are installed under /usr/local/freeway. On VMS systems, they are installed under SYS$SYSDEVICE:[FREEWAY]. On Windows NT systems, they are installed under C:\freeway.

B.1.1 Server-resident Software

Server-resident software includes any non-client software that runs exclusively on the Freeway server processor. This software is located in the freeway/boot directory. During the boot process, server-resident software is loaded from the boot server into the server processor. There are two types of software loaded: the boot files and the service providers.

If you move files from the freeway/boot directory, you must modify the System Boot Directory parameter as described in Section 4.5.1 on page 148.

B.1.2 ICP-resident Software

ICP-resident software includes any software that runs on the Freeway ICPs. This software is in the freeway/boot directory (for example, xio_2432.mem, sps_fw_2432.mem, and fmp_fw_2432.mem). Prior to June 1, 1998, these files were distributed in separate subdirectories under the freeway/icpcode directory. As a result, the freeway/boot/ *ppp*load files provided with protocols with a release date prior to June 1, 1998 contain a fully qualified path for the protocol and XIO image files. Such files should be modified to remove the path to the XIO image. This allows Freeway to boot the local copy of the XIO image provided in the boot directory with the current Freeway server release.

If you move any of these files, you must modify the path in the load file to point to the new location. For a description of the load file, refer to Chapter 2.

B.1.3 Client-resident Software

Client-resident software includes any software that runs as a client to the Freeway server msgmux (message multiplexor) task, whether it runs on a remote client or on the Freeway server itself. This software consists of test programs and application program interfaces (DLI/TSI) described in the following sections.

In general, software built on client machines links with the DLI/TSI library file in the freeway/client/*op-sys*/lib directory, where *op-sys* is the identifier for the operating system you are using. For convenience, you can move this library file into a working directory for each protocol application you are developing. If you do so, you must modify the make file that builds the loopback test program so that it points to the new location of the DLI/TSI library. Building the loopback test program is described in Section 2.2.8 on page 53 for UNIX, Section 2.3.7 on page 71 for VMS, or Section 2.4.8 on page 90 for Windows NT.

Glossary

The common Freeway terms and acronyms are defined below.

BOOTP	Bootstrap protocol
boot server	A client computer that downloads software onto Freeway (that is, "boots" Freeway). During this operation, Freeway becomes a client of the boot server.
client	An entity on the LAN that uses the services offered by Freeway. To conform with the industry use of this term, a client refers to an application program which is running on a host somewhere on the network and communicates with Freeway through a LAN connection. This term in no way implies usage of a specific LAN host platform, and no assumption is made as to the distribution of clients on the LAN. See also "process."
CPU	Central processing unit
Data Link Interface	See DLI/TSI
DLI/TSI	The Data Link Interface (DLI) and Transport Subsystem Interface (TSI) provide a programming library of routines to facilitate data transfer to and from Freeway using a standard interface across protocols.

Freeway	Freeway refers to the entire server in terms of hardware and software. The hardware includes items such as the server processor board and the ICPs. The software includes functions such as server management, LAN and protocol services, and protocol software executing on the ICPs. For a specific product configuration, the terms Freeway 1100, Freeway 1150, Freeway 2000, Freeway 4000, and Freeway 8800 are used.
FTP	The file transfer protocol, described in RFC-783, is used during the boot process.
ICP	Protogate's intelligent communications processor (ICP) board that supports serial protocols. Freeway 1100 and Freeway 1150 support Protogate's ICP2424 and ICP2432 processors. Freeway 2000, Freeway 4000, and Freeway 8800 support Protogate's ICP6000 processors. An ICP is also referred to as a "WAN interface processor."
ICP_IP	A virtual device which appears to the rest of the Freeway (and to all client applications) just like a physical ICP board except that it transmits and receives data via an IP network rather than via a serial line.
ICP-resident software	Protogate-supplied communication protocol software or user-customized software that runs on the ICP to process the data stream between the ICP and the WAN devices. Refer to the *Freeway Protocol Software Toolkit Programmer's Guide* for customized software.
IP	Internet protocol, described by RFC-791
LAN	Local area network

LAN protocol	The hardware and software which comprise the LAN and form the basis of communications between Freeway servers and clients. An example LAN protocol is TCP/IP running over Ethernet.
MIB	Management information base
NVRAM	Non-volatile random access memory
operating system	Code that provides the necessary scheduling and management functions for tasks and services. The VxWorks operating system runs on the server processor board, and Protogate's OS/Impact real-time executive runs on the ICPs.
process	Code executing on a LAN-based host and equivalent to the "client" term.
RAM	Random access memory
resource	A resource available in the Freeway server. Typically, resource refers to an ICP board within the server, a port on a board, or a WAN protocol running on an ICP.
RFC	Request For Comment is a method of establishing requirements for the INTERNET network (formerly, ARPANET). These requirements form the basis for much of the LAN connectivity used with Freeway, including TCP/IP, User Datagram Protocol (UDP), telnet, SNMP, FTP, bootp, etc.
RSH	Remote shell; networking software used during the boot process to transfer files.
SCSI	Small computer systems interface

SDK	Software development kit
server processor	The Freeway server processor board, which is capable of executing the server's operating system and functions such as server management.
server-resident software	Software that runs on the server processor board and processes the data stream between the LAN and WAN connections. Server-resident software can be either supplied by Protogate or customized by the user.
service	A more generalized view of resource where a grouping is made on a per-protocol basis. For example, the FMP protocol has a number of resources: the ICP, the ports available on the ICP, and the protocol running on the ICP. Collectively, these resources describe the service.
service provider	A task that operates on the Freeway server processor board and provides specific processing related to a particular service. An example is the data link service provider which performs processing on the server processor board to support the FMP protocol operating on an ICP6000 communication board.
service user	An entity that uses server resources by interfacing to a service provider. Service users can be tasks that reside on the server and access the service providers directly or they can be processes, or clients, which reside on other machines and access the service providers across the network.
SMSP	Server management service provider
SNMP	Simple network management protocol

task	"Task" is used to differentiate between code executing on Freeway's server processor board or the ICP, and code executing on a LAN host, which is referred to as a "process".
TCP	Transmission control protocol, described in RFC-793
TCP/IP	Transmission control protocol/internet protocol
Transport Subsystem Interface	See DLI/TSI
TSI	See DLI/TSI
UDP	User datagram protocol, described in RFC-768
WAN	Wide area network
WAN interface processor	A board containing hardware, and possibly software, used to offer a particular communication protocol service. For instance, Protogate's ICP6000 is a WAN interface processor board that supports serial communication protocols such as FMP.

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